

MODERN Machine Shop

HOWARD CAMPBELL, Editor

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FEBRUARY, 1938

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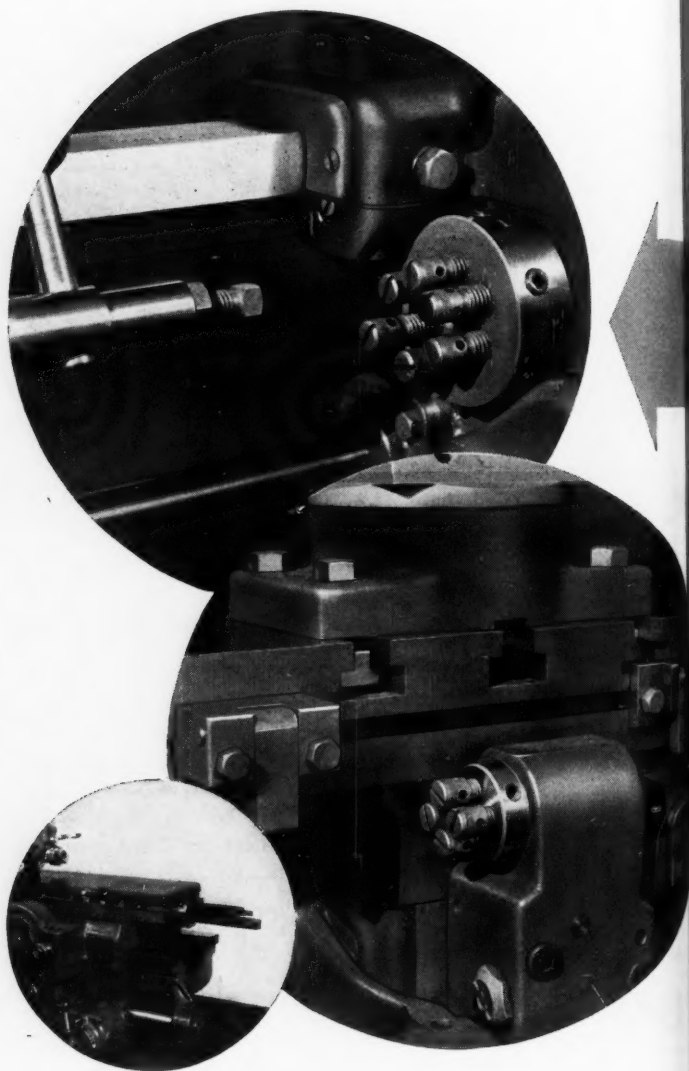


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MODERN Machine Shop

CINCINNATI, OHIO

FEBRUARY, 1938

VOL. 10, No. 9

Production Operations on "Easy" Home Laundry Equip- ment

The Author Describes Some Interesting Operations On a Well-Known Product.

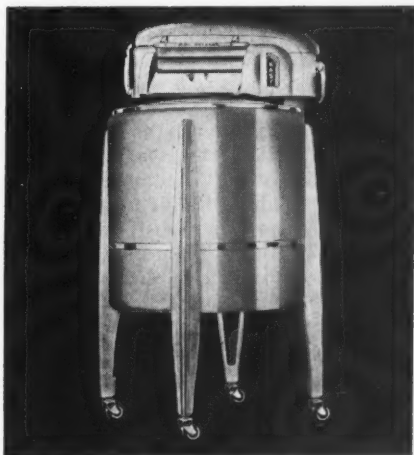
By HOWARD CAMPBELL

THE old saw about the "better mouse trap" could well be amended to include washing machines—if the machines are Easy washers. For here is a product so good that the demand has necessitated increasing the manufacturing capacity each year for the past three years and the present plant, which is less than a year old, is already too small to meet the demand.

The plant in which the Easy washers are made is, however, of the modern daylight type of construction and the equipment is very largely of most recent design. Some of the manufacturing operations of Easy washers are described in this article.

The washer is pretty largely made from heavy sheet steel, rust-proofed by the Bonderizing process and enameled to provide the necessary resistance to moisture and to wear. Both

washers and ironers are finished in gleaming white or white and gray



"Easy" Washer.



Fig. 1—After rolling, the ends are brought together and a slot is punched at the joint to provide clearance for the gear case.

combinations to match other modern appliances. Streamline styling has been employed to produce a product that will be pleasing to the eye and the design is based on a simplicity of structure that is convenient to the user. The Bonderite treatment greatly increases the rust-resisting qualities of the sheet steel base, legs, and so on, and holds the enamel finish to the base. This is the same treatment that is given to steel automobile bodies. The high gloss baked enamel finish withstands chipping and crazing, even when subjected to shocks and blows far greater than would be experienced in normal use.

The base skirt of the washer is made from 0.050-in. sheet steel, the steel being cut into strips of the correct width and length to make one skirt. To give the steel the necessary cylindrical form, each sheet is

passed through a rolling machine which curves it on the desired radius so that the ends will just match. The machine also rolls a bead on one end and a radius on the other.

As the skirt leaves the rolling machine, it passes to the Niagara press shown in Fig. 1, where a slot is punched in the skirt at the joint to provide clearance for the gear case. When the joint is at the top, the skirt is placed in position in the fixture, where it rests on projecting pins. To bring the two ends of the skirt together and hold them while a section is punched out, the operator grasps and swings two handles as shown in the illustration. Swinging the handles operates a cam mechanism attached to a clamp which forces the loose ends of the skirt toward the center as this operation is performed, the two handles simultaneously, the



Fig. 2—The joint is welded and a bracket is welded in position in the same operation by this Federal welder.

Fig. 3 (x) piercing.

Fig. 4 (x) e

ends are point d press. this po press a

The skirt is ing end operati eral w locating of the a bracket ends w bracket ously. of steel

Fig. 5—



Fig. 3 (above)—Base skirt in position for piercing. The 38 holes are pierced from the inside.



Fig. 4 (right)—Base skirt in position for riveting a brace on the inside.

ends are brought together at a central point directly under the ram of the press. Holding the skirt tightly in this position, the operator trips the press and the section is punched out.

The third operation on the base skirt is that of welding the adjoining ends of the skirt together, which operation is performed in the Federal welder shown in Fig. 2. While locating the skirt underneath the ram of the welder, the operator also places a bracket in position so that the steel ends will be welded together and the bracket will be welded on simultaneously. The skirt is now a solid ring of steel.

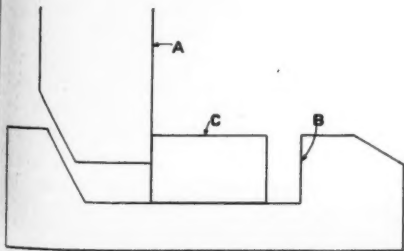


Fig. 5—Drawing showing principle upon which riveting mechanism operates.

In the fourth operation, for which a Bliss press is required as shown in Fig. 3, 38 holes are punched in the base skirt. The die is of the center expansion or wedge type. As the ram descends, the work-piece is carried down to a point where it is in position for punching, the die plates being arranged around the outside with the punch plates inside. As the ram continues to descend, the punch plates strike a 45-deg. taper which forces them out, thus piercing the skirt as required.

In the fifth operation, a brace is riveted into the base skirt, for which a Bliss press is used. This set-up is shown in Fig. 4. The brace is placed in position in the skirt and a rivet is inserted through the holes from the outside, then the piece is placed in position in the fixture with the head of the rivet in contact with a buck on the side nearest the ram. The ram is tapered on the rear to correspond with a similar taper on the rear end of the riveting punch, as shown in Fig. 5. As the ram A descends, the punch B is forced back,

forming a head on the free end of the rivet and pinning the brace to the skirt. There are two rivets in this piece. From here the skirts are carried through the degreasing, Bonderizing and enameling operations.

The agitator drive cap is an aluminum casting comprising practically a hub with a central hole in which are six splines. These splines are roughly formed in the casting but must be machined to make them absolutely accurate as required in the assembly. The finish broaching operation is performed in a LaPointe vertical hydraulic broach, shown ready for operation in Fig. 6.

To locate the drive cap properly,

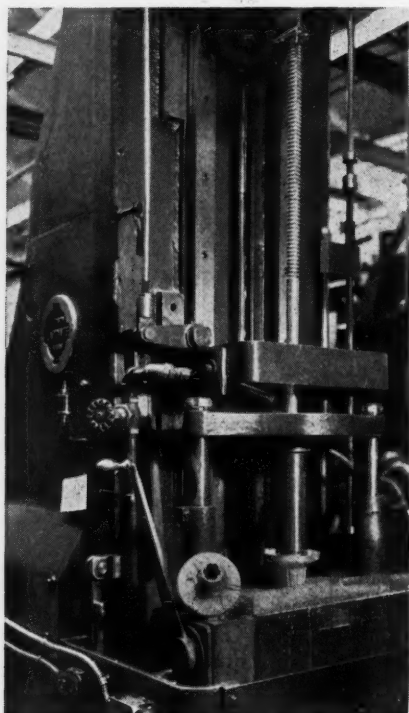


Fig. 6—Vertical broaching machine with agitator drive cap in position for broaching splines. A finished cap can be seen at the left end of the fixture.

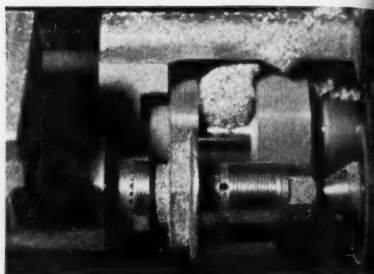


Fig. 7—Two threads of different diameters milled simultaneously in this thread milling machine.

the tapered end is set into a hole in the fixture with the flange end up. Then a clamp is lowered to bear upon the flange, the clamp itself being of cylindrical form, as shown, with a central hole through which the broach passes as it proceeds with cutting the splines. The clamp is raised and lowered by means of the hand lever shown at the left end of the fixture. Each one of the six splines is 0.375 to 0.375-in. wide, 1.375 to 1.377-in. across the bottom and 1.160 to 1.160 in. over the top of the spline.

As the broach nears the bottom of the stroke, it is released at the top of the ram and pulled through from the bottom. The stroke completed, the machine stops. The piece is then removed after which power is again applied and the broach is raised through the fixture to a point where it again engages the locking mechanism at the top of the ram. At the same time it is released at the bottom of the ram, allowing the broach to be raised to a point which will allow the operator to change the workpieces. This broaching operation is performed at a rate of 120 pieces per hour.

A thread milling operation in which threads are milled on two different diameters simultaneously, is shown in Fig. 7. The work-piece is a dryer base bushing and bearing as

HIGH SPEED

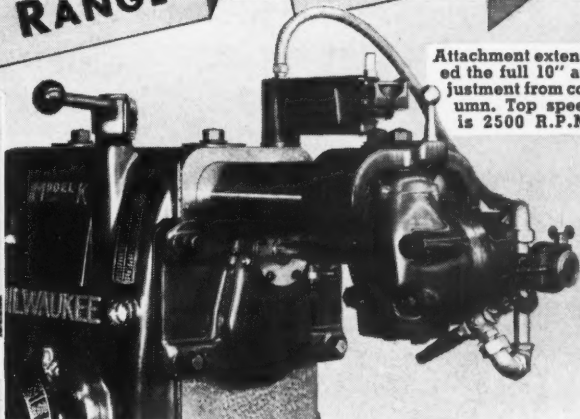
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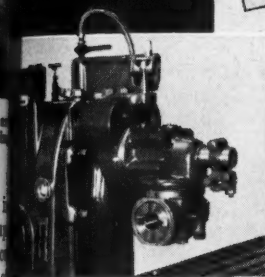
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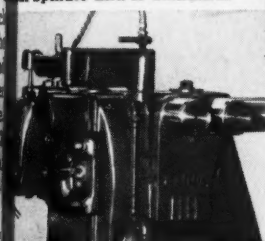
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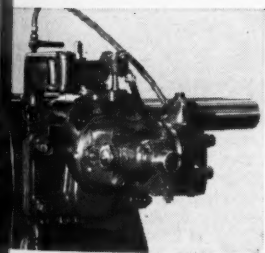
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Attachment "parked" on stub overarms.



ssembly, made of brass, and the thread is 18 Pitch. One diameter is $1\frac{1}{4}$ -in. and the other is $1\frac{1}{2}$ -in. This is simply a routine job for the Hanson-Whitney thread miller on which the operation is performed and is one of a wide

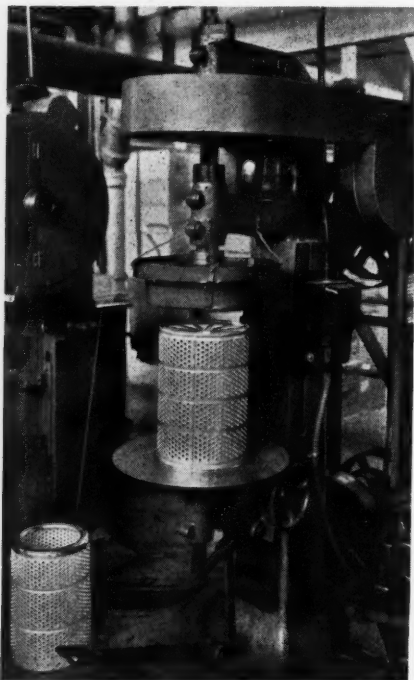


Fig. 8—Niagara special machine used for flanging over and rolling beading on bottom of centrifugal dryer basket.

variety of threading operations that are performed on this machine.

The machine shown in Fig. 8 is used to flange over the end and roll a bead on the bottom of the centrifugal dryer basket. A basket can be seen in the machine, in position for rolling and beading, and a finished basket can be seen on the floor. The machine is a No. 4 Niagara seaming machine which has been equipped with special rolling tools designed particularly for this job.

(The concluding section of this article published in the March issue of this magazine.)

Steel Belt Lacing Products. Bulletin No. 728 of Bristol Steel Belt Lacing Products has been completed for distribution by The Bristol Company, Torrington, Conn. The bulletin contains application information regarding various styles and sizes available and lists prices. Copy free upon request.

The "American" Super Hole Winder is a radial drill built with 3, 4, 5 and 6 arms and 11-in. diameter column. The subject of a 22-page booklet now distributed by The American Tool & Die Company, Cincinnati, Ohio. The booklet, designated as Bulletin No. 10, is devoted to photographs and descriptions of the various parts of the machine. One page is occupied by a head transmission diagram which shows the mechanism for obtaining nine spindle speeds. Specifications covering the four sizes of the "American" Super Hole Winder are included. Copy of the bulletin free upon request.

"25 Easy Ways to Cut Machine Costs" is the title of a case record now being issued by Continental Machine Specialties, Inc., 1301 Washburn Ave. South, Minneapolis, Minn. The usual feature of the book is that it is made up of actual reports describing both conventional types of work and unusual jobs performed by machine tooling.

Numerous action photographs and drawings are included in the booklet, the text of which consists of direct quotations from users of contour sawing, filing, summaries of their comments and editorial material which has appeared in trade publications. Some of the interesting applications of machine tooling described in the booklet include the sawing of a 9-ft. $1\frac{1}{2}$ -in. master milling machine cam, the turning of the slug for the punch in die manufacturing nickel steel, sawing of castings for inspection purposes, shaping of plastics and heavy precision work of various kinds fabricated to close limits of accuracy.

The book contains 64 pages of 11-in. size, more than 75 illustrations, data sheets, production charts and other pertinent information regarding time saving methods and improved production. Copy free upon request.

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Recent Developments in Machine Tool Electrification

By W. S. RISSE

Works Equipment Department, Westinghouse Electric & Mfg. Co., East Pittsburgh

THE application of individual motor drive to machine tools in a manner that will make available the utmost possibilities of the machine presents a problem to which a great deal of thought has been given by both the motor manufacturer and the machine tool builder.

In the earlier days of motor application, it was more or less a matter of taking the belt driven machine as it had been designed and mounting the motor wherever it was convenient without much thought as to the appearance or efficiency of the drive. As progress was made along this line, a closer cooperation was developed

between the electrical manufacturer and the machine tool builder, with a view of making the motor and drive a part of the machine and not an afterthought. This situation has been brought about by the necessity of making the machines more automatic and easier for the operator to handle, resulting in a more efficient machine and one capable of a greater output. There was also a demand for a machine with a better appearance.

Developments in machine tool design and methods of operating have brought out the need for certain types of motors to perform certain conditions, with the result that the

builder has developed motors with proper characteristics for the particular application which the machine was designed. To this end there are many types available for the motor builder to select from. In a certain sense, the motor is now a part of the machine tool, and the machine tool builder must select the motor which will give the best results in the particular application.

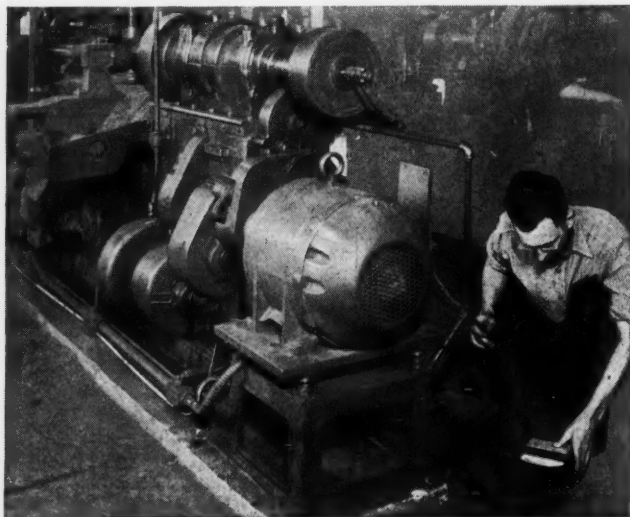


Fig. 1 — Application of totally enclosed fan motor to machine tool.

electrical characteristics to suit almost any condition that can be set by the machine designer. The simplest application of motor involves the use of a standard

with the high slip the motor will slow down under load and allow the flywheel to take part of the load when the actual punching or shearing operation is performed.

Most machine tools have change gears to secure changes in spindle speeds, but there are times when these can be supplemented or part of them eliminated by using a multiple speed A.C. motor. This type of motor has certain drawbacks in that it is limited to certain definite speeds and these speeds may not be the most efficient ones at which the machine should be operating. Where it is desirable to have an ad-

justable speed motor, it is quite often better to use a direct current adjustable speed motor, the speed of which can be varied over a considerable range in small increments. Where this is possible, the design of the machine

Fig. 2—A totally enclosed fan cooled motor driving a chuck machine, to eliminate trouble due to cast iron dust going into motor winding. Drive from motor to machine is by means of V-belts.

quirrel cage induction A.C. motor, of this particular type of motor will be satisfactory in a large number of cases. However, it becomes necessary at times to provide a motor with higher starting torque than can be

obtained with a general purpose motor having, as a result, a squirrel cage motor has been developed to give starting torques from 2 to 2½ times the full load torque. These motors would be used on certain types of pumps, conveyors, rolls and other applications where higher starting torques are necessary.

In a case of machines having flywheels with a high inertia such as punch presses, shears, and so on, a high torque motor with a high "slip" works out to better advantage, since

can often be simplified and change gears eliminated, using electrical control to vary the spindle speed by varying the speed of the motor.

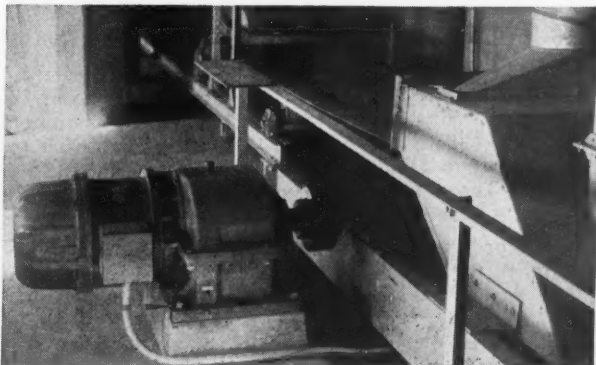
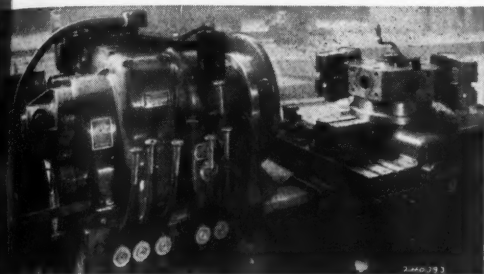


Fig. 3—Application of a gearmotor to a belt conveyor. A totally enclosed fan cooled motor is used in this case.

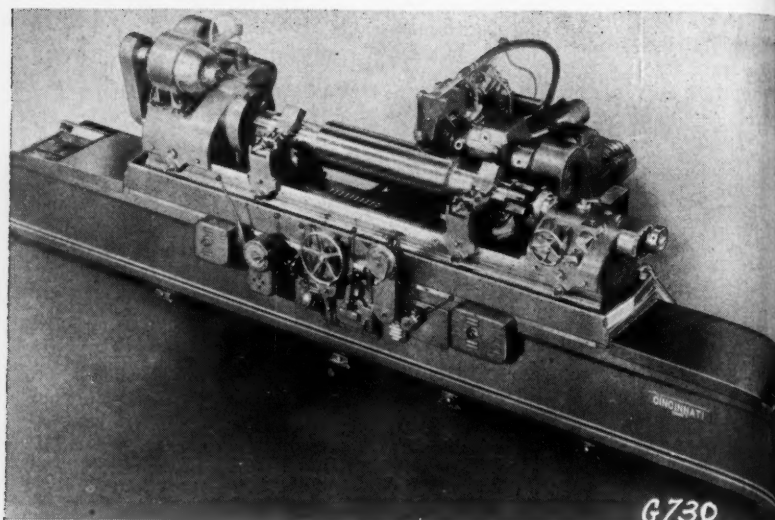


Fig. 4—A large grinder with six motors to take care of various grinding operations.

The question of dirt and foreign particles getting into the motor windings has in a great number of cases been a problem for the Maintenance Engineer, and, as a result, totally-enclosed fan cooled motors have been developed whose dimensions compare favorably with a standard open motor. On applications where abrasive and metallic dust is present, this type of motor will solve the problem. Such places as foundries, cement plants and machine shops in which a great deal of cast iron is machined are good examples of applications for this type of motor, also applications where there are fumes or liquids which are liable to come in contact with the motor windings.

Figures 1 and 2 show two applications of totally enclosed fan cooled motors in use on jobs where it was necessary to protect the windings against cast iron dust. These machines formerly were driven by standard open motors, but filtration of dust into the windings caused so much

trouble that the change was made to enclosed motors. In some instances the trend to motors of this type becoming more apparent as the advantages are studied from the point of maintenance.

Another type of motor which has a comparatively recent origin is the gearmotor, which is a motor and reduction gear built as one unit. This combination provides a unit with an output of slower speeds than can be obtained with a standard motor. In a great many cases the main drive shaft of a machine may have to rotate at a slow speed, and by using a gearmotor a much more simple and more compact drive can be obtained than would be the case with a motor and separate gear reduction. Gearmotors are available from 1 to 75 h.p. and speeds from 1550 to 4.8 r.p.m. and there is a wide variety from which to choose. Figure 3 shows an application of a gearmotor to a conveyor and it is to be noted that this is a totally enclosed fan cooled unit.

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Fig. 232

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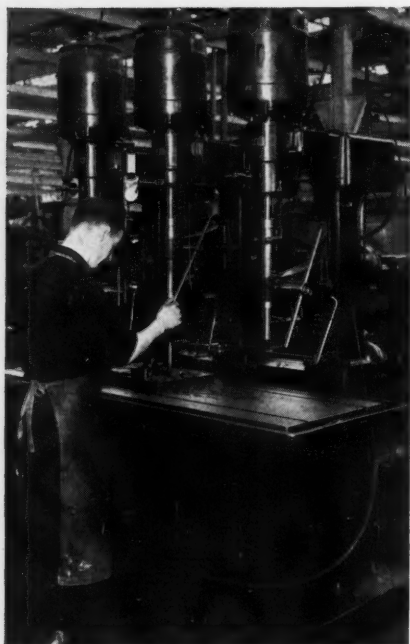


Fig. 5—A special 4-speed vertical reversing motor driving a drill press. Belts are eliminated and the reversing motor provides means for tapping.

The necessity for quality and quantity production at minimum cost,

which has been brought about by competition, demands that machine tools used in production operate at their maximum efficiency. To meet this end automatic machines have been developed which perform several operations or functions, and in the course of development it has been found practical to have the various functions of the machine controlled electrically. In many cases several different motors are used on the same machine to eliminate mechanical means of operation which may be expensive and not so efficient.

Machine tools such as boring mills, planers, large lathes, grinders and some types of milling machines have several motors in addition to the main drive motor, each of the motors performing a certain function and each interlocked so that the function will be performed in proper sequence. For example, a large boring mill will have a main drive motor for driving the table, a motor for raising and lowering the crossrail, another motor for clamping the rail position, and still another motor for operating an oil lubricating pump. Figure 4 shows a large roll grinder equipped with six motors

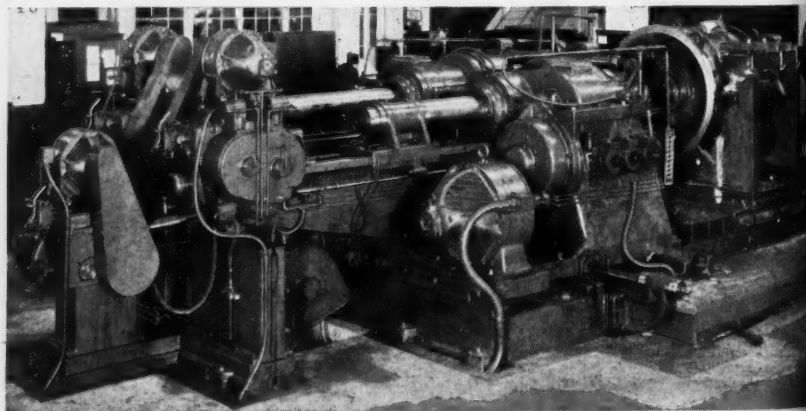
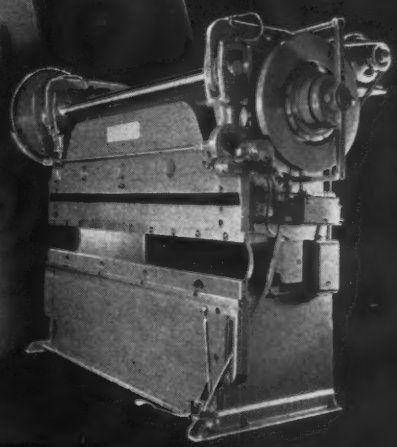


Fig. 6—A special 3-spindle horizontal boring machine driven by seven motors. The control cabinet is shown in a cabinet at the left of the picture.

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parallel within .005 inch
under full load, contribute to
this accuracy



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to take care of the various operations required of the machine.

Figure 6 shows a special three spindle, horizontal boring machine equipped with seven motors and special control. The spindles are driven by two 35 h.p. motors and one 10 h.p. motor, all adjustable speed direct



Fig. 7—A surface grinder with a special motor built into the frame of the machine for driving the spindle. In this case only the rotor and stator of the motor were furnished and the machine tool builder mounted this rotor and stator into the frame of the machine.

current. A 5 h.p. constant speed d.c. motor takes care of traversing the work table, and three 3 h.p. constant speed d.c. motors drive hydraulic feed pumps. A special control panel simplifies the task of controlling the various motors.

The control mechanism is so designed that the feed pump motors cannot run unless the spindle motors are

operating. Also, the traverse motor cannot operate if any of the spindle motors are running. All motors are reversing and a special button push button station is provided for operating the machine. The three spindle motors can be stopped simultaneously by means of a stop switch incorporated in the special push button.

It is just as important that the proper type of control be selected for the machine tool in question as it is to select the proper type of motor, for the motors cannot function to best advantage unless the control is properly designed. This is particularly true in the case of special machines where there are several motors which must be interlocked to perform certain operations in sequence. In the case of the boring mill described above and shown in Fig. 7, the control can be arranged so that no motors will be started unless the lubrication pump motor is in operation. This will prevent running the table without lubrication. In the case of a cross

where motors are used to clamp and unclamp the rail, the control should be arranged so that the cross cannot be moved up or down unless the rail is unclamped. This can be arranged automatically by the use of the proper control. Limit switches will limit the upward travel of the rail.

The methods of mounting motor

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vary with the type of machine, the method of drive. Some prefer the standard foot-mounted motor for all applications, so that motor has to be changed, it will be necessary to carry special motor. In some cases a special motor mounting is desirable to effect a more



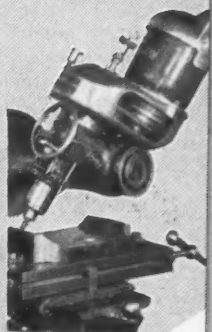
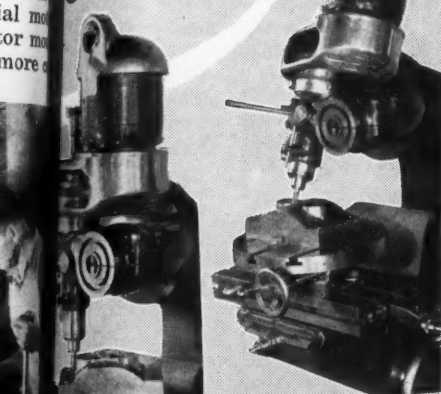
Fig. 8—Vertical motor driving an engine machine. The drive from the motor to spindle is by means of V-belts.

compact drive and present a neater appearance. Figures 5, 6 and 7 show machines with special mounting. In the case of machine shown in Fig. 8 the motors are of the 4-speed, reversing type to provide for drilling and tapping with all belts eliminated.

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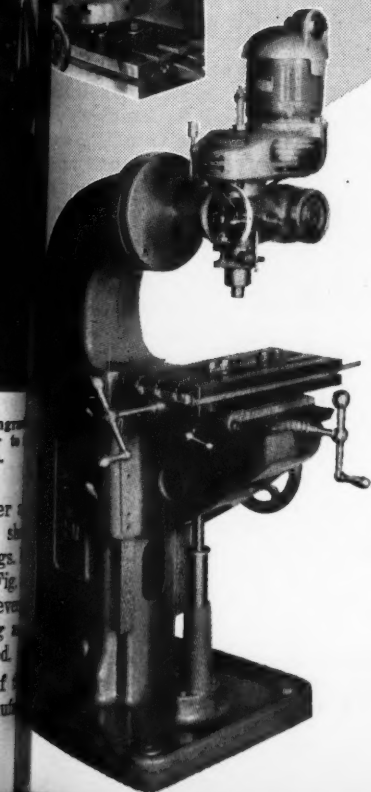


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turers have endeavored to design control devices such as push buttons, limit switches and control panels which can be built into the machine and made an integral part of it. This eliminates the necessity of trying to find a place to mount the control after the machine is built, and not

the operator can see whether the motor or motors are overloaded, whether the right speeds and feeds are being used. If it is a special machine involving a number of motors and considerable control equipment, these meters may be mounted on a panel at a place convenient for

operator to

The use of meters may result in the elimination of breakdowns and loss of production. Another recent development is the use of detachable instruments which can be plugged into a socket mounted in the motor circuit. With this arrangement the performance of the motor driving the machine can be studied at the instrument. The instrument can be moved from one machine to another. Such equipment helps to eliminate guesswork as to the operation of any particular machine.

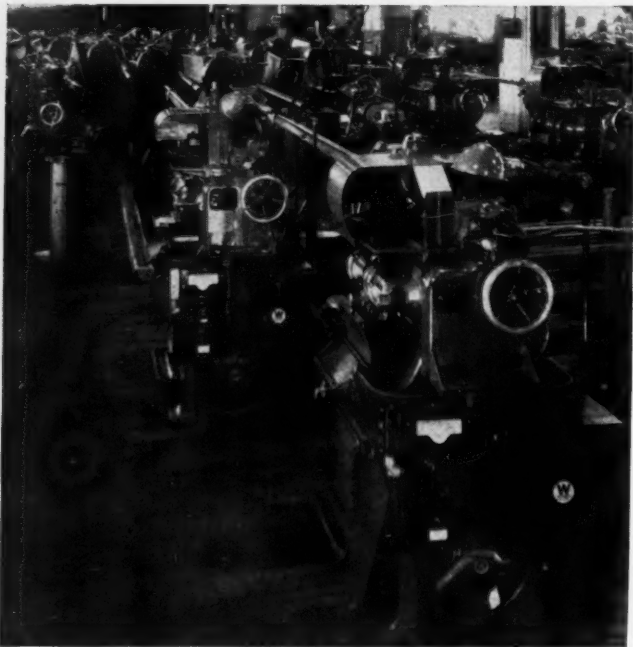


Fig. 9—Battery of screw machines showing motors mounted in the bases of the machines. Motors are protected but are readily accessible in case of any trouble.

only improves the appearance, but also protects these control devices since they are inside the machine. Care should be taken in mounting such equipment that provision is made for getting at these various controls to inspect and repair them when necessary.

In order to determine the efficiency at which a machine tool is performing, meters are often installed as a part of the control system so that

dous strides have been made in the past in connection with motor application to machine tools, both by the electrical manufacturer and the machine tool builder are continuing to work together to improve their product to the advantage of not only themselves but of industry as a whole.

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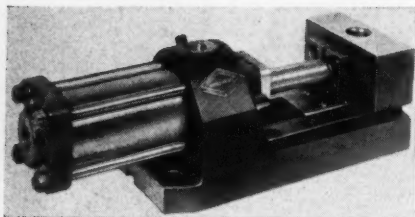


Fig. 1—Mid-West "Hydro-Pierce" Hydraulic Unit

By L. E. ALLEN

Chief Engineer, Mid-West Production Engineering, Inc., Detroit, Michigan

EVERY now and again, after methods of processing have apparently become sufficiently standardized so that the performance of certain types of operations with certain types of tools is taken for granted, someone bobs up with a new idea which short-circuits some of the more extensive operations and simplifies tasks which previously have been more or less complicated.

Holes in metal parts are practically always either drilled or punched. Drilling as a rule takes somewhat more time than punching, but even on sheet metal parts which are thin enough to punch, it has often been necessary to drill certain holes because of the difficulty or impossibility of getting the parts into a punch press so that these holes could be pierced.

It is true that stamping presses are now being built of almost unbelievable size and dies are being designed with which it is possible to pierce

The Newest Thing in Punching Equipment is the Individual Punch Unit With Which Holes Can Be Punched In Any Direction or in Several Directions Simultaneously.

sheet steel parts in vertical and horizontal directions simultaneously. Still, such operations have heretofore been subject to the limitations imposed by the size of the press and the fact that the power was derived from the ram which operated in one direction only. Holes which could not be pierced in one operation in the press have necessitated subsequent piercing operations or other operations in which drills or other tools were used.

Now, however, another forward step in manufacturing practice has been taken. Limitations as to the size of the work, shape or contour of the work, and directions in which the piercing operations can be performed have been removed. Holes can be pierced in practically any direction on work of intricate design and heretofore impossible size, by the use of one or more simple units actuated by hydraulic power. The advantage of hydraulic power lies, of course, in the ability to convey this power around corners and into places which could not possibly be reached by the use of the orthodox stamping tools. The use

Fig. 2—Gas piercing

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Fig. 3—

Fig. 2—Group of hydraulic piercing and drilling units.



of these units eliminates necessity for construction and maintenance of the large cam dies which are usually necessary for this type of work and the immense presses that are necessary to make the dies effective. These units also make it possible to pierce all the holes on a piece of work in one machine and in one set-up, thus insuring a uniform product and the accuracy necessary for ease in assembling. Holes may also be pierced after all reinforcements on the work have been welded in place, thus reducing the number of operations.

The unit is so constructed that it can easily be moved or removed to meet engineering changes in the work or for interchangeability of stampings for various models. Not the least important of its advantages is the

fact that when the design of the work-piece has become obsolete, the units may easily be adjusted to conform to the design of the new part.

The unit consists of a cylinder, solid piston with rings, shaft attached to a punch holder which carries the punch or punches, stripper, springs and screws, and gibs for the punch holder, all mounted on a casting which is slotted for the necessary keys and drilled for hold-down screws.

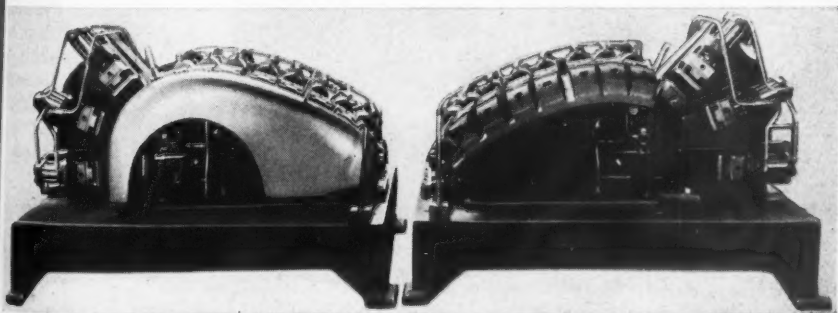
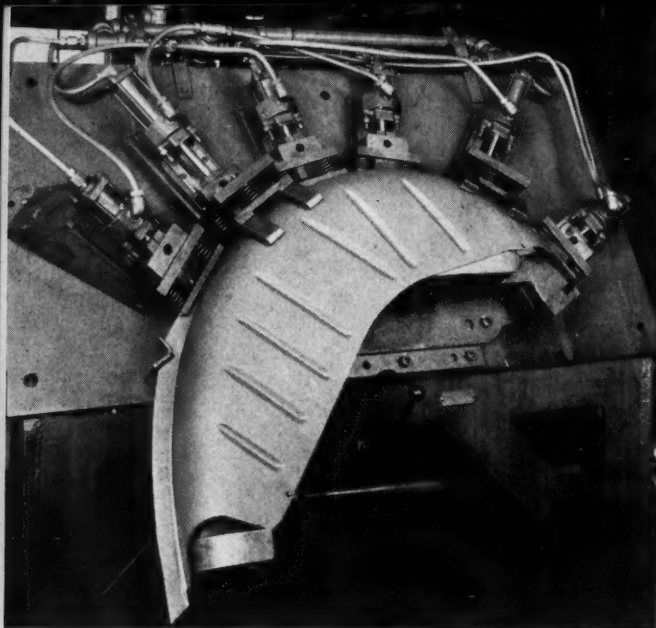


Fig. 3—Fixture employing hydraulic piercing units for piercing holes in automobile rear fenders.



February,
Fig. 4—Wheel house panel in position for piercing on fixture employing six piercing units arranged radially and at a variety of angles.

Power is supplied to the unit by a hydraulic power plant which, although more than powerful enough for the job, is small enough and light enough so that it can be moved about as required by the job. With this power plant a machine or fixture can be

in a position to suit the loading and unloading of the part instead of having to unload under the ram and between the uprights of a press. In many cases clamps to hold the parts are unnecessary and, where necessary, hydraulically operated toggle clamps

may be used to further speed up the operation.

One of the units, complete except for the connection to the power plant, is shown in Fig. 1. Figure 2 shows a group of various sizes of units made in bores varying from 1 1/4-in. to 6-in. With the stand-

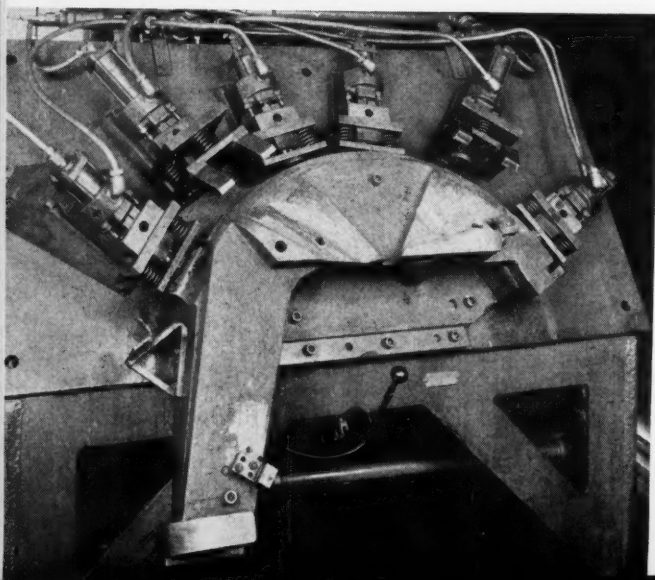
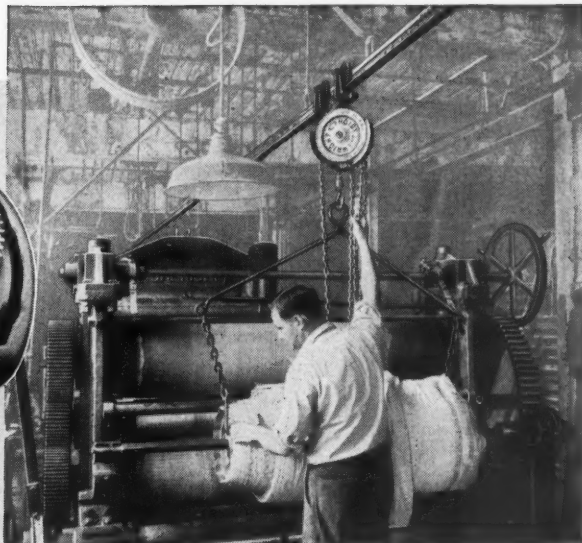
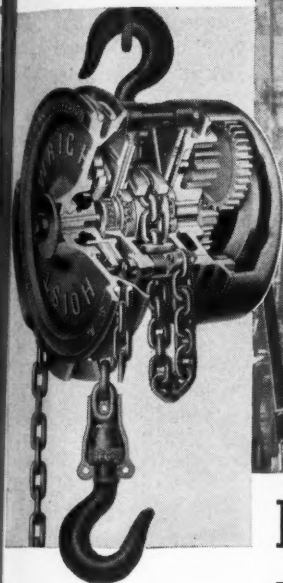


Fig. 5—Wheel House Panel Fixture. Note simplicity of construction.

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ard power plant supplied by the manufacturer of the units, these units will deliver from 1 to 28 tons pressure, depending on the size of the unit. Several punches and retainers may be mounted on each unit if desired. Any size of unit can be built for any length of stroke and may be set up

being the size which delivers 43 gals. of oil per minute at 2000 lbs. pressure. This plant uses a high-volume low-pressure pump for the rapid stroke and a high-pressure pump for the piercing, this pump operates automatically at the correct time.

This illustration also shows a hydraulic unit which has been adapted for drilling or reaming. The hydraulic cylinder is used for feeding and a motor is mounted as a part of the assembly to supply power to the two-spindle drill head. Used in conjunction with a flow control valve, the desired amount of feed can be obtained.

A simple type of fixture for the application of the "Hydro-Pierce" unit is shown in Fig. 6. Here are two fixtures for punching automobile rear fenders, one for the left and one for the right hand fender. A fender is shown in position on the fixture at the left while the other is left empty so that the mechanism can

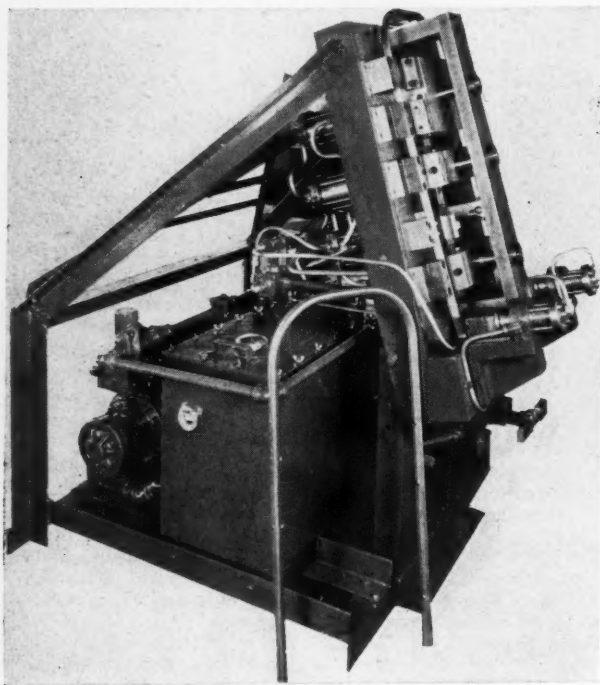


Fig. 6—This machine pierces and forms six holes in metal chair frames and also forms the floor ends.

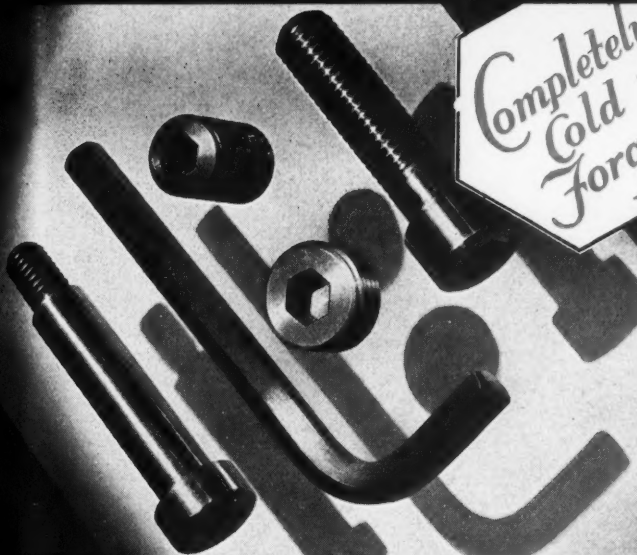
at any desired angle. However, the manufacturer recommends that the stroke be not less than 3-in. so that an interchangeable type of punch and retainer may be used and so that punches may be replaced without removing the unit from the fixture.

The standard hydraulic power plant for use with these units is made in a variety of sizes, the most popular

being the size which delivers 43 gals. of oil per minute at 2000 lbs. pressure. This plant uses a high-volume low-pressure pump for the rapid stroke and a high-pressure pump for the piercing, this pump operates automatically at the correct time. This illustration also shows a hydraulic unit which has been adapted for drilling or reaming. The hydraulic cylinder is used for feeding and a motor is mounted as a part of the assembly to supply power to the two-spindle drill head. Used in conjunction with a flow control valve, the desired amount of feed can be obtained. A simple type of fixture for the application of the "Hydro-Pierce" unit is shown in Fig. 6. Here are two fixtures for punching automobile rear fenders, one for the left and one for the right hand fender. A fender is shown in position on the fixture at the left while the other is left empty so that the mechanism can be seen. Eleven units are employed on each one of the fixtures, eight to pierce holes in a horizontal direction and three to pierce holes radially in the curved section of the fender. It is obvious that a fender can be handled into and out of one of these fixtures with comparative ease. The punching units operate almost simultaneously upon operation of the

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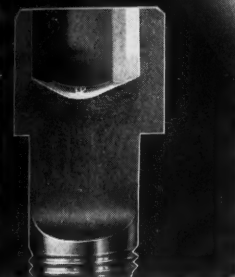
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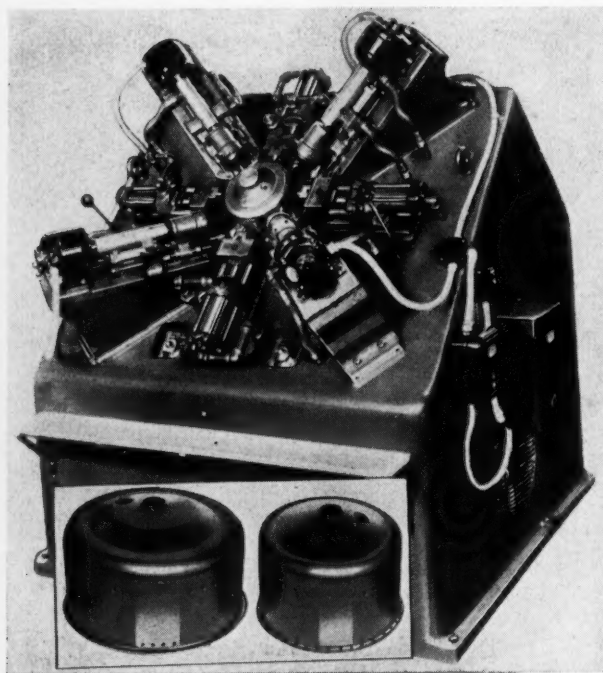


Fig. 7—Fixture employing four hydraulic piercing units and four hydraulic drilling units for piercing and drilling metal bowls.

hand lever which can be seen at the right hand end of the left hand fixture.

The wheel house panel illustrated in Fig. 4 is so designed that not only are a number of holes required to be

that is located at the correct height for easy handling and is tilted backward slightly so that the panel can be dropped into place without effort. Also, with this design the units are far enough removed from the op-

punched radii but these holes may be punched at various angles and in various planes. An interesting feature of this fixture is the manner in which the clamps are applied. There are four clamps, made of steel and machined to fit the curve of the panel. Two are welded to each of the two of the supports; thus as hydraulic power is applied, the clamps bear against the panel and hold it in position while the punching operation is in process.

The fixture with the panel removed is shown in Fig. 8. The simplicity of the fixture is evident. The units are arranged on a



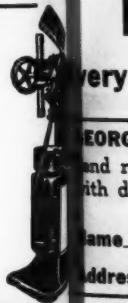
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ator for safety and makes it possible to observe the operation of the units from the natural working position.

The fixture shown in Fig. 6 was designed for the application of hydraulic piercing units for the piercing of six holes in steel chair frames. A small amount of forming is involved around the hole, as can be seen by inspection of the simple frame which is shown resting against the corner of the fixture. The fixture is of comparatively simple and inexpensive construction, being built up of steel angles and plates cut to the necessary length and shape and welded together. Such a fixture can easily be designed by a good tool designer. The fixture proper, in which the frame is held while the operation is performed, is located at a convenient height for the operator and, as can be seen by reference to the illustration, is tipped backward slightly so that the piece will naturally locate

itself in the correct position. clamps are hydraulically operated and are powered from the same unit supplies power for piercing and forming the holes. The outfit is economical to build and highly efficient in operation.

A more complicated type of fixture is shown in Fig. 7. This fixture is designed to employ hydraulic piercing and drilling units for the piercing and drilling of three different sizes of metal cylindrical parts which, in want of a better name, we will call "bowls." In some of the bowls the holes are pierced and in some the holes on the periphery are pierced and those in the radius are drilled. This can be seen from the illustration. The drilling units are mounted on adjustable bases. To operate the machine, the operating lever is moved forward, opening the hydraulic circuit and applying pressure which causes the lever to move out against the work and

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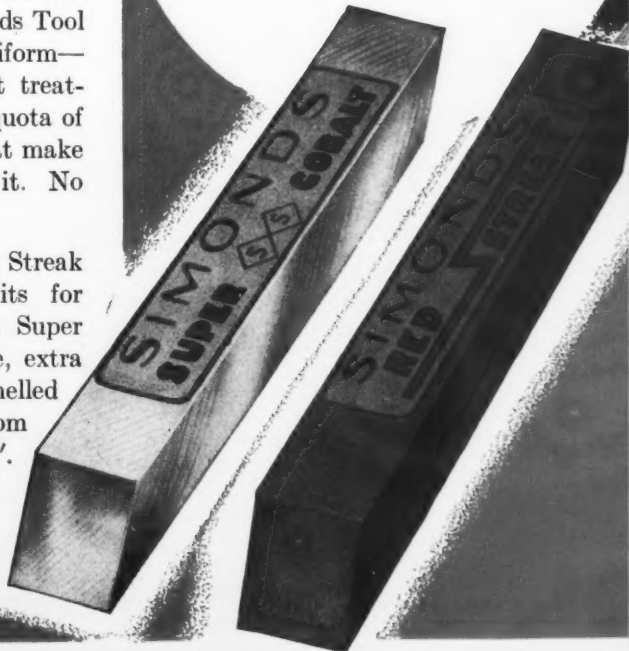
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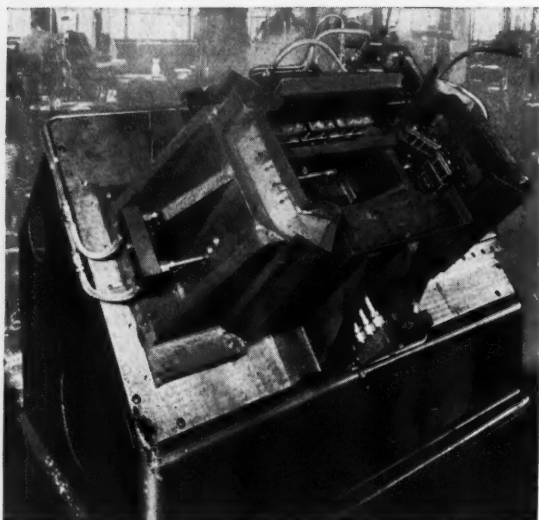


Fig. 8—Machine employing hydraulic piercing units for making holes in the flange of English gas tank.

four piercing units to move in and perform the piercing operation. The lever is then reversed, causing the dies to move away from the work and stripping the punches, after which the bowls are automatically indexed nine degrees to position for the next holes.

After the piercing operation, the bowls which require holes in the radius are drilled. The drilling units are controlled by a lever at the left of the machine which is moved forward, opening the circuit and applying power to operate the four hydraulic drilling units in the same manner as the piercing unit. Thus both rows of holes are processed rapidly and accu-

ately with an automatic nine degree index without handling of work until the operation has been completed. An interesting feature of this job consists in that the small holes are 0.063 inch in diameter and are pierced in the stock which is 0.107 inch thick.

A machine of somewhat larger size, designed to pierce holes in a gas tank, is shown in Figs. 8 and 9. The tank is built with a flange and welded in place, the flange requiring holes evenly spaced clear around. Twelve units are employed, as shown in Fig. 8, each unit carrying a punch and a stripper plate



Fig. 9—Machine with gas tank in position for piercing.

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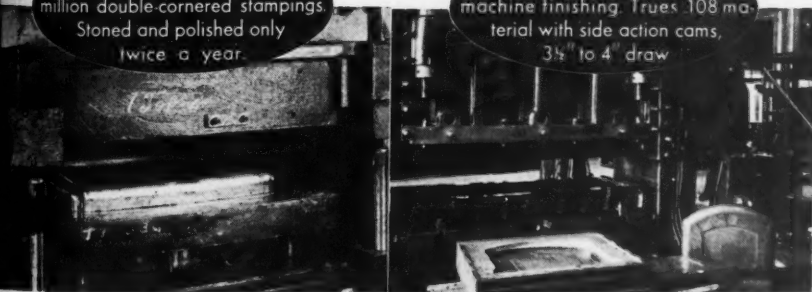
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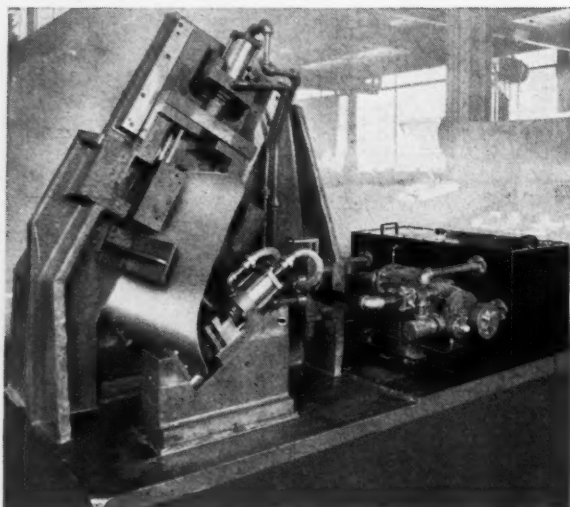


Fig. 10—Four hinge holes are pierced and the handle hole is punched, flanged and coined to accurate dimension in this machine.

shown. The bracket on the upper and right hand sides moves in and out to permit loading and unloading the machine. The machine with a tank in position for piercing is shown in Fig. 9. Twenty-four holes are pierced in this tank in the one operation, the complete time, floor to floor, being six seconds.

A machine designed to employ hydraulic piercing units for piercing the hinge holes in a deck lid assembly for an automobile is shown in Fig. 10. The assembly consists of three thicknesses of metal, comprising the outer deck lid, the inside deck lid, and a re-

inforcement. Three units are employed in this machine, one on each side, carrying punches for punching the hinge holes and one at the top of the machine for piercing the lock handle hole. The lock handle hole is a flanged hole, the length of flange of which must be held to a decimal dimension. To obtain this accuracy, the hydraulic cylinder operates a series of punches which in turn first operate the punch to pierce the workpiece, then to flange and finally coin the end of the flange to the desired length. This machine is interchangeable to pierce deck lids for four different cars.

It is very apparent that the variety of applications to which this equipment can be adapted is practically unlimited.

(Illustrations courtesy Mid-West Production Engineering, Inc.)

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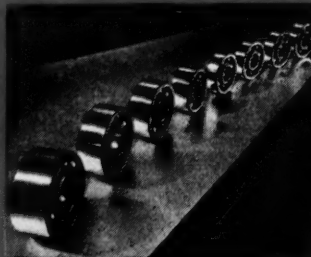
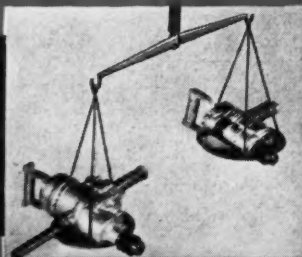
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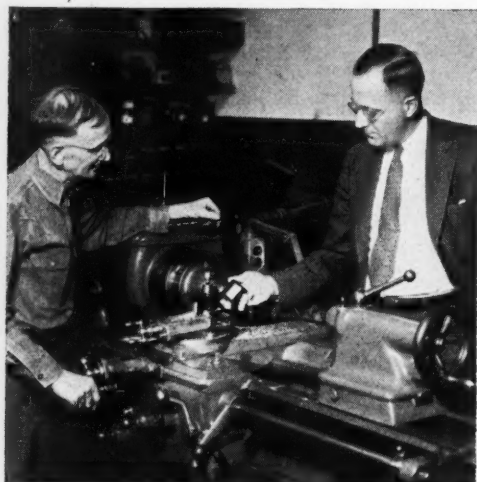
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As simply as a thermometer records temperature, the Light Meter measures the amount of illumination available for seeing.

BY DEAN M. WARREN

General Electric Company, Nela Park Engineering Department, Cleveland, Ohio

IN this era of close tolerances and precision manufacturing, the eyes are continually called upon to perform critical tasks that necessitate extreme visual concentration to insure accuracy. Although it is possible for the eye to adapt itself to see under a fraction of a footcandle, it is, nevertheless, a scientifically proven fact that adequate illumination insures easier seeing, helps conserve eyesight and energy, and improves employee efficiency and morale.

In a laboratory test conducted some time ago with two groups of workers, one with good eyes and the other with poor eyes, the first group increased their rate of working 14 per cent when the lighting was raised from 3 to 12 footcandles, and those with poor eyes increased their working rate by 22 per cent. An interesting fact revealed by this test was that those with poor eyes received the most benefit, thus

indicating that light helps to balance the inequalities in the performance of human beings by greatly helping those who most need help.

Adequate light, however, is not the only factor that must be considered in light conditioning the machine shop. The quality of lighting, embracing such factors as glare and its effect on the eyes and seeing, reflected glare, diffusion, shadows, and so on, are equally important. For instance, it has been proved that glare causes nervous muscular tension, with a resultant waste of useful energy, just as do low levels of illumination. A glare source at a point 20 degrees from the line of vision, providing 5 footcandles at the eyes and 5 footcandles upon the visual task, produced the same degree of nervous muscular tension as was produced when performing the same visual task illuminated by one footcandle without glare.

Light Conditioning for Quick and Accurate Seeing in the Machine Shop

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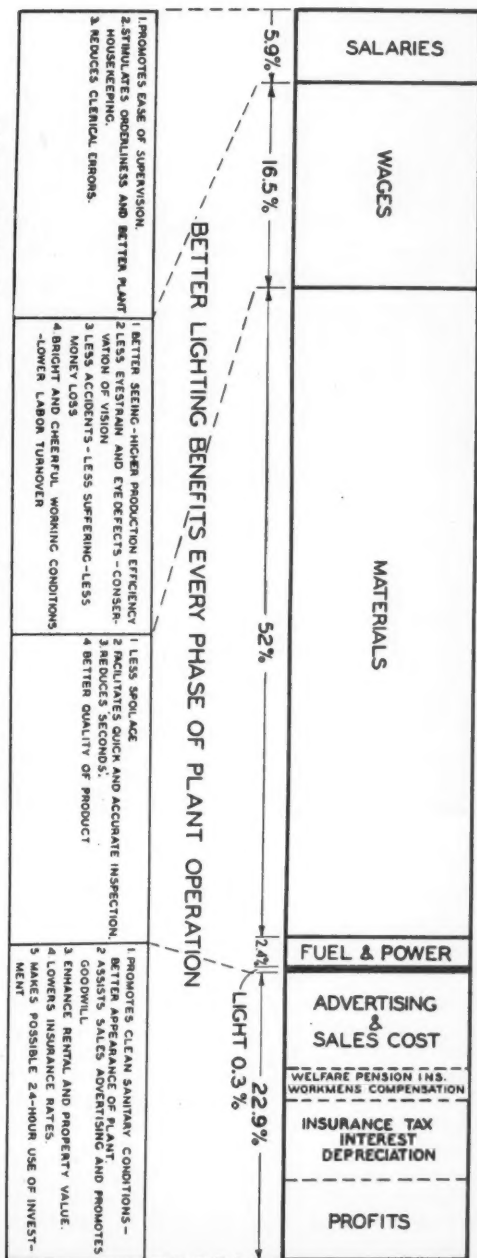
From present knowledge about the relation between poor seeing and nervous muscular tension it can be concluded with assurance that poor quality of lighting produces effects as deep-seated as those associated with too little light.

Direct glare is probably the most frequent and serious cause of bad lighting. It results, among other things, from unshaded or inadequately shaded light sources located within the field of vision or from too great a contrast between the bright light source and a dark background, or adjacent surfaces. Glare can be avoided by the proper choice and location of reflecting and diffusing equipment.

Reflected glare comes from polished objects, such as are encountered in machining metal parts. It is generally impossible to change the character of the work or the nature of the seeing task in order to avoid these potential reflections, but they can be minimized by (1) properly shielding the light source, (2) proper positioning of the light source, and (3) specifying a source of such dimensions that it is of low brightness.

Shadows are merely differences in brightness of surfaces that can be regulated by the choice and location of the lighting equipment. While some shadow is essential in discerning objects in their three dimensions, harsh shadows are a potential accident hazard and should be avoided. This can be done by using the

This Production Cost Chart provides a sound basis upon which lighting costs and economics may be studied.





General lighting in excess of 40 footcandles is provided in this machine tool plant from system of 400-watt mercury lamps in special industrial reflectors.

proper type of equipment, and properly locating it to insure a reasonably uniform distribution of light.

There are many different types of lighting equipment on the market today that provide the quality of lighting required in the machine shop. Examples are the Glassteel Diffuser, Silvered Bowl units, indirect trough unit, RLM Dome unit with white bowl lamp, and the large area diffusing units. Examples of each type are shown in the accompanying illustrations of lighting application in machine shops.

Uniform Illumination First Step in Light Conditioning

In order to have good seeing conditions throughout the machine shop, it is first necessary to provide a good system of overhead lighting to consist of symmetrically-arranged light sources mounted overhead, usually according to bays, to produce uniform illumination throughout the work area. Even illumination prevents harsh shadows and contrasts, and every work position should enjoy the same degree of illumination.

The evenness of illumination from

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The machine shop shown here is temporarily equipped with two different general lighting systems; a Glasteel Diffuser installation and the new Silvered Bowl Diffuser Units, soon to be placed on the market by the manufacturers of RLM reflectors. The photograph shows the lighting results. Actually, the Silvered Bowl system delivers more light to the working plane than the Glasteel Diffuser installation and is less glaring when viewed from wide angles. However, at some angles the Glasteel Diffuser has a lower surface brightness than the Silvered Bowl unit, shadows on the work plane are softer, and reflected glare is reduced. This shop is also equipped with supplementary lighting units which provide approximately 250 footcandles at the points where critical seeing facilities are necessary.

an overhead system is governed almost entirely by the relation of the spacing between the units to their height above the floor. In rooms of the usual ceiling height of 10 to 14 feet, uniform illumination will be obtained if the outlets are spaced no farther apart than their height above the floor. In rooms having higher ceilings, the spacing should not exceed $1\frac{1}{2}$ times the height of the units above the work plane. The distance from the side walls to the first row of units should not exceed $\frac{1}{2}$ the permissible spacing. Where work benches or machines are located close to the wall, the distance of the units

from the wall should not exceed $\frac{1}{3}$ the permissible spacing.

Supplementary Lighting for Critical Seeing Tasks

Certain visual tasks require higher levels of lighting than can be economically provided by the general lighting system alone. For these tasks, which are generally performed within a restricted area, the lighting should be tailored to fit the job. A helpful analogy might be made between the fit of one's clothes and the different lighting systems. When buying clothes, if all one requires is protection from grease and dirt, a pair

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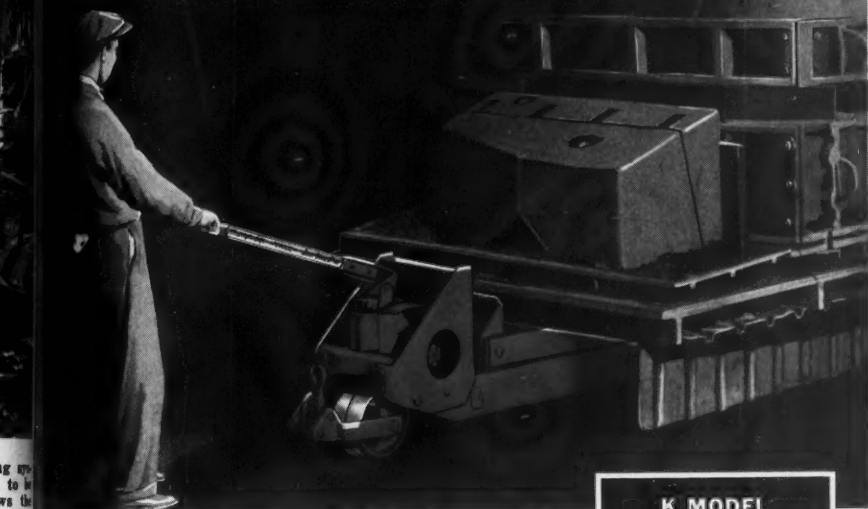
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of overalls, cut to fit almost anyone, and designed to serve a variety of purposes, is quite satisfactory. The same applies to lighting. A general system of lighting is designed to fit a variety of ordinary visual tasks, but it is not adequate for the most critical

ored to fit the job.

This tailor-made lighting is designated by the name "General Light Plus", or "Supplementary Lighting". As the name implies, it is a "supplement" of general lighting.

Supplementary lighting may be any one of three different forms. The unit may be built into the machine, may be attached to the machine, or it may be located at or near the ceiling, so directed as to build up illumination at the point where the severity of the visual task dictates the amount of light. Where the method of mounting is employed, the unit is out of reach of the operator and its position cannot be changed whenever the work strikes him, nor can he use it as a convenient source of electrical supply for the attachment of some electrical device which he may wish to use temporarily. Operators do this frequently where the lighting unit is accessible and just as frequently they forget to replace the lamp bulb, particularly if it happens to get knocked off the machine and is broken.

Some time ago the writer was in a machine shop where pear-shaped half shade supplementary lighting units were attached directly to the machines. At one of the machines an operator was filing a large hoop and had adjusted his local light

to "help" him see the surface he was filing. In its "helpful" position, the lamp was shining directly into his eyes. The operator was undoubtedly aware of annoyance from the glare light, but he probably was not aware



This supplementary lighting unit, located at the ceiling, provides in excess of 100 footcandles of light at the tool point. When the machinist is working at the machine the general lighting system would, of course, also be lighted.

ones. When a person wants the best possible fit in clothes he has them tailored. Likewise, lighting for particularly tough seeing tasks, such as fine assembly, fine inspection, fine buffing and polishing, should be tail-

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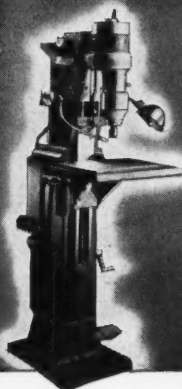
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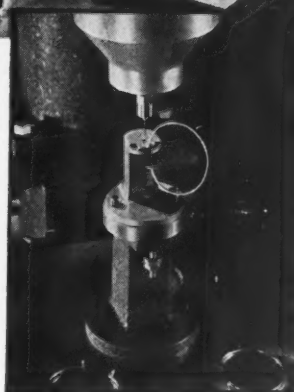


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EUROPEAN REPRESENTATIVE—G. E. MARBAIX, LTD., HUMGLAS HOUSE, LONDON, S. W. 1

of the fact that the pupils of his eyes had contracted automatically, thus restricting the opening for "seeing" light to enter. The result was that some 75 to 80 per cent of the useful light was wasted counteracting the effect of glare. Had the unit been located out of reach of the operator, and properly louvered, this could not have happened.

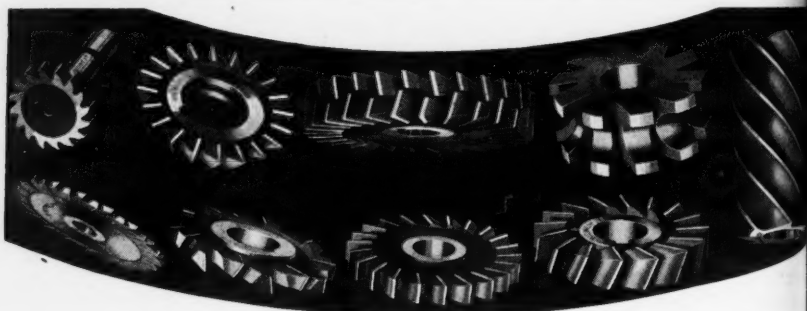
Where supplementary lighting is used, care must always be taken to insure comfortable contrasts between the well lighted work area and the surrounding areas by providing a sufficient amount of general illumination. This is accomplished, in general, by providing one footcandle of general lighting for every 10 footcandles of supplementary lighting. For example, if the general lighting system supplied 15 footcandles, the localized work area could be illuminated to approximately 150 footcandles without the contrasts being

too sharp and severe.

Light Conditioning the Drafting Room

The work of the drafting room is a well balanced use of intelligence, manual skill, and vision, and only who has made drafting his vocation can realize the constant strain on his eyesight as he works on a fine tailed drawing throughout the day. The accepted level of illumination in drafting rooms has been rapidly increasing during the past few years because managements are realizing that one of the most important elements of the drafting room is the ability to see. Today the recommended level is 30 to 50 footcandles and managements are providing more.

The most common error in drafting room lighting is in the selection of luminaire. In many instances where enclosing globes have been installed and the lighting result has been



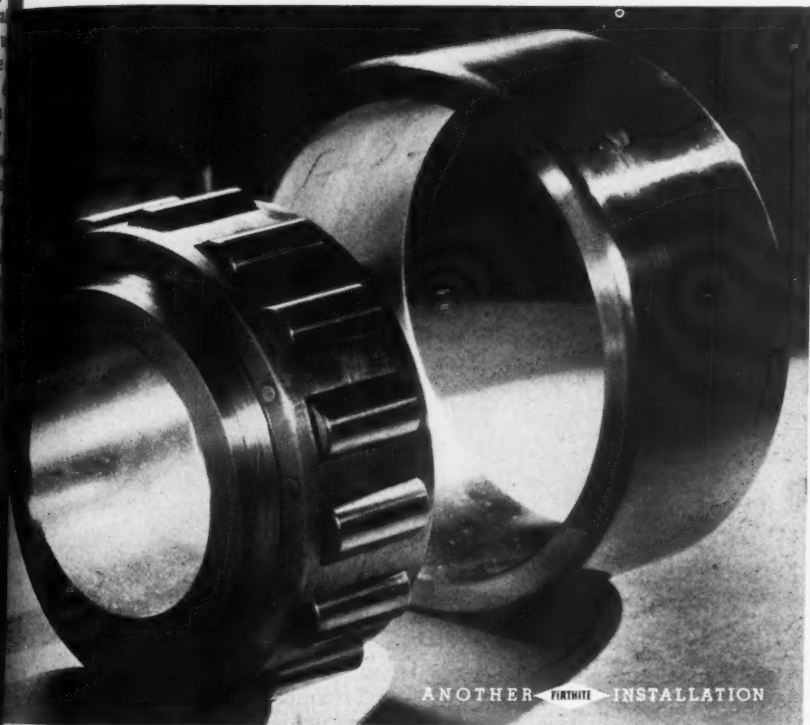
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In addition to the Mercury Vapor Lamps with which the tool grinding department at the Taft-Peirce plant is illuminated, supplementary "Lo-calite" lighting is provided at the machines to facilitate close work.

satisfactory. The reason for this is to be found in the comparatively high brightness of the units which causes uncomfortable glare and poor diffusion with bothersome shadows. Sharp or dense shadows are extremely annoying in the drafting room, especially those cast by the edge of a T-square or triangle or by the hands of the draftsman.

The most acceptable practice for drafting room lighting is to provide a good mat-white ceiling, and to use a totally-indirect unit. This type of unit directs all of the light to the ceiling where it is diffused and reflected back down to the drafting table. Reflected glare is negligible and the

Although this size wire can carry 15 amperes safely, it cannot do so economically for any considerable distance. The drop in a branch circuit of No. 14 wire will reach 2 volts when it carries 15 amperes only 100 feet. This has not prevented the use of such circuits to runs of 100 feet or more with resultant losses greater than they should be. In industrial service it is considered good practice to limit each 15 ampere branch circuit to an initial load of not more than 1000 watts, to use no wire smaller than No. 12, and to allow no branch runs to exceed 100 feet to the first outlet. The wire capacity to

shadows are
and luminous

Voltage—A Factor in ing

The efficient economical production of light requires wire of sufficient capacity to carry electrical energy from the distribution panels to the lamp sockets without excessive voltage drop. A 1 per cent drop in voltage changes the light output of an incandescent lamp about 3 per cent and a 5-volt drop results in a loss of about 16 per cent in light output.

In the past, practically all branch circuits for lighting have been No. 14

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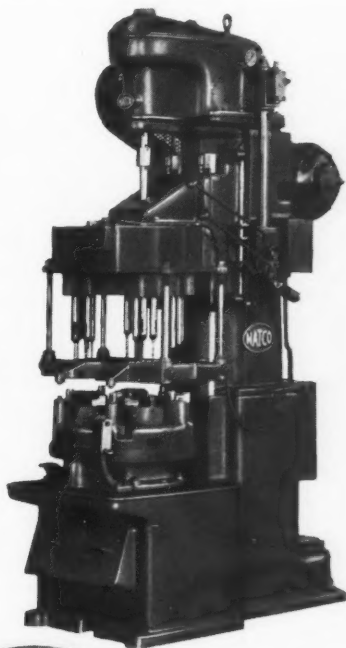
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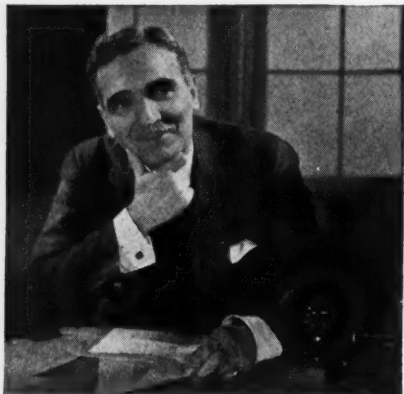
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installed will, of course, vary with character of the work done in shop, but 5 watts per square foot is not an excessive allowance to make for areas where seeing is important.

It is also a wise precaution to provide ample capacity in the original wiring installation when the cost of additional capacity is low. To obtain the same additional capacity by rewiring is usually much more expensive, and sometimes almost impossible to achieve.

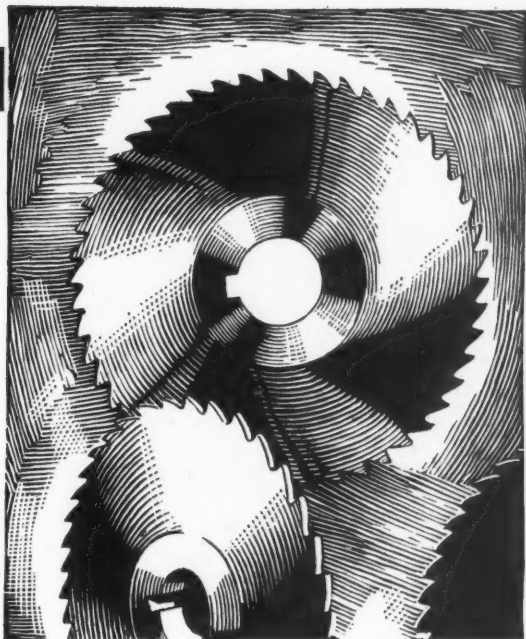
Paint—Its Relationship to Lighting Conditioning

Carbon plays a very important part in the operating efficiency of an automobile. Engineering skill creates a motor that is powerful and efficient but only as long as it is kept reasonably free from carbon. When carbon is allowed to accumulate the motor becomes sluggish, inefficient, and costly to operate.

A lighting system is very similar to an automobile in this respect. It is designed to produce so many foot candles of illumination on a given task, but like the automobile engine it also has its vulnerable spots which must be kept in good condition, otherwise the installation will become inefficient and costly to operate. No matter how carefully designed a lighting system may be with respect to type and size of lamps, type and make of reflector, spacing of outlets or how well maintained, if the surroundings are not adapted to reflecting a good percentage of the light striking them, an inefficient system is bound to result. Frequent painting and a good maintenance schedule keep the lighting system "running smoothly."

In an average sized machine shop having a ceiling and side walls with reflection factors of 30 per cent and 10 per cent respectively (a condition

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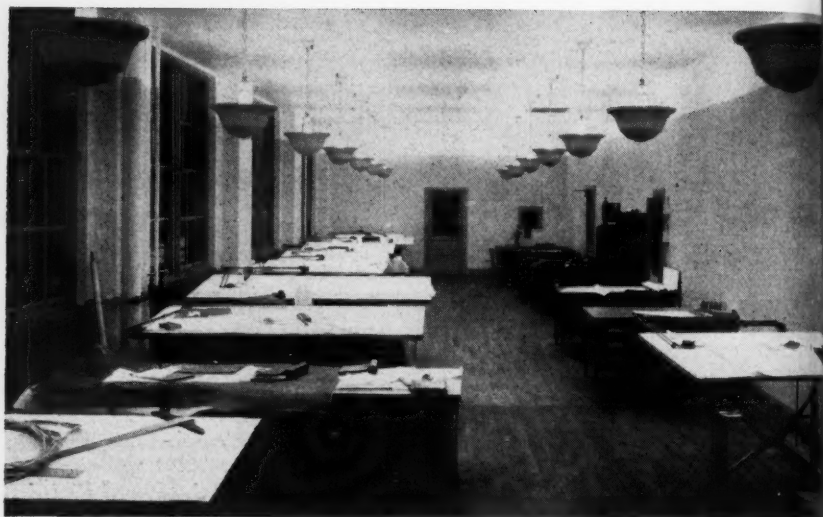
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Comfortable, shadow-free illumination of 40 footcandles is provided in this drafting room from totally-indirect luminaires.

which is quite common), repainting the ceiling so that it will reflect 75 per cent of the light striking it and the side walls 50 per cent will increase the level of illumination on the work approximately 10 per cent.

In a drafting room where similar conditions might exist, repainting to secure 75 per cent and 50 per cent reflection from ceiling and walls will about triple the illumination where indirect units are used.

Repainting every few years can be justified from an economic point of view. It cannot, however, be placed entirely on a dollars and cents basis. Environment plays such an important part in the productiveness of the employee that repainting should really be done whenever the interior appears dirty and depressing.

What Does Light Conditioning Cost?

The chart showing a break down of manufacturing costs gives a sound basis on which light conditioning and economics may be studied. This chart

attempts only to picture light conditioning and its benefits in relation to the entire production problem. The figures given are average ones for all types of industries and naturally they will vary somewhat for any particular industry or plant. If the percentage representing the lighting alone is separated from the fuel and power cost item, it appears as only about 3/10 of 1 per cent of the value of the manufactured product. Interpreted another way, this means that for every \$3 it costs to make a product, about 1 cent is paid to enable the worker to try to see what he is doing.

Since raw materials represent more than 50 per cent of the total production cost, it is obvious that a very little saving in spoilage of materials would pay for an excellent light conditioning job. Also, a tiny reduction in "seconds" means money in the manufacturer's pocket and adequate lighting is a very inexpensive means

(Continued on page 130)

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Note These 6 Important Features

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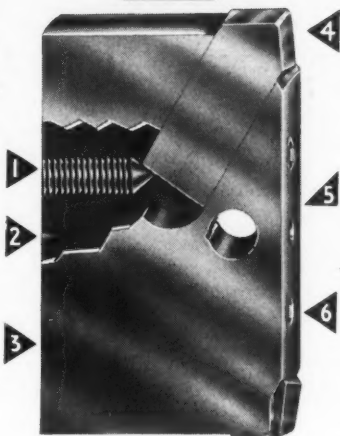
2. CENTERS, accurately located with relation to Tapered Locating Hole, permit grinding of the blocks between centers, eliminating the need of grinding arbors.

3. BLOCK BODY, made of specially rolled alloy tool steel of a quality which may be hardened for cutting tools. Made up to the largest practical dimensions, considering the bar diameters and bores for which it is recommended.

4. CUTTING BLADES, manufactured with greatest precision possible are interchangeable within type and size limitations. Blades are the largest practical size considering block dimensions, insuring proper heat radiation and maximum cutting life.

5. TAPERED LOCATING HOLE centralizes block perfectly and when in position brings block firmly up against back and bottom of slot, giving block a perfect and evenly distributed bearing the full length of the slot.

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BY HERBERT R. ISENBURGER

President, St. John X-Ray Service, Inc., Long Island City, N. Y.

THE application of the X-ray to the inspection of materials is slowly but surely making progress in metal manufacturing. The greatest advantage of this method of inspection is the detection of defects before expensive machining has been done. It is quite obvious that but few machine shops have sufficient work available to justify the expense of having their own X-ray department, and usually such shops ship their pieces to the nearest laboratory specializing in radiography. There are a few such laboratories in existence in the larger industrial centers of the country. The shipping of the work requires time and in many cases the cost of machining without X-ray inspection has been preferred. In other instances X-ray examination was desirable, but the castings or forgings were so heavy that they could not be handled readily by the X-ray laboratory. Although the machinist would have liked to obtain radiographic proof that his material was free from

internal flaws, he was not able to do so to certain limitations of the process.

This drawback has now been overcome through the introduction of portable X-ray units such as the one shown in the heading illustration. The complete equipment, which is mounted on a trailer chassis, consists of a single tank transformer which includes the valve tubes and condensers, control board with switches and meters, water pump for cooling the X-ray tube as well as a collapsible tube stand, the tube, and 30 feet of cable when the unit is in transit. The cables connect the tube with the transformer. The trailer cover can be utilized as a field darkroom.

The tube is of the ray- and shock-proof type, air-insulated and water-cooled. The target is constructed on the line-focus principle which assures an approximately point source of radiation. This item is very important for sharp details in the resulting negatives. Another feature of the tube is an electron grid which filters out all



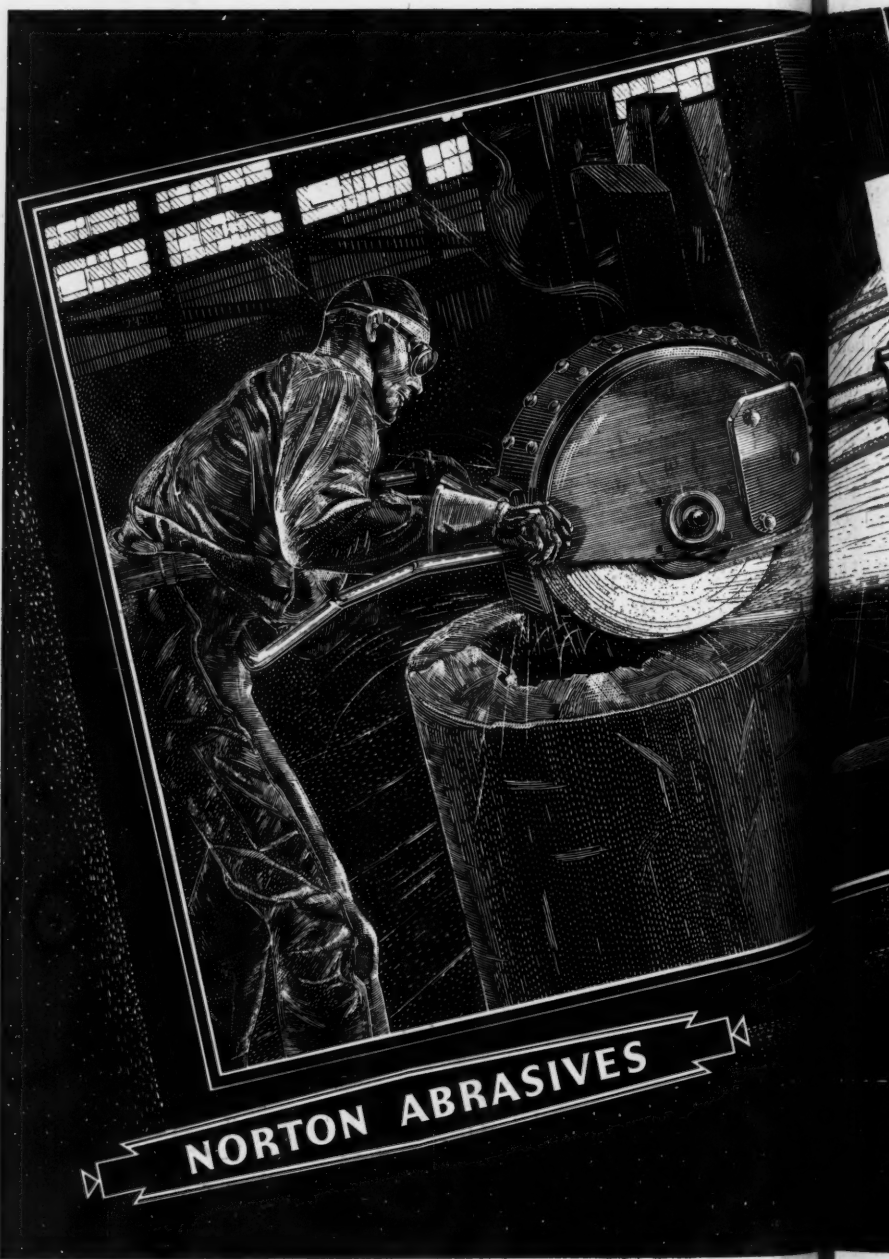
COLLAPSING TAPS

FOR internal threading the Geometric Class S Tap saves money, time and trouble—and produces better threads. Solid, sturdy chasers, rigidly supported in the body of the tool, withstand heavy strains; yet ample chip space insures smooth cutting. With the positive trip, the tap cannot jam nor fail to open. The fine workmanship of a precision-built tool brings clean, accurate screw threads. Shall we send you a catalog?

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IN YOUR FOUNDRY we can prove to you by actual performance tests that Norton foundry wheels are best for your requirements. No matter what kind of castings you make, Norton engineers — foundry specialists — can select from the complete Norton line the exact wheels necessary to get production at rock bottom grinding costs.

NORTON COMPANY, WORCESTER, MASS.



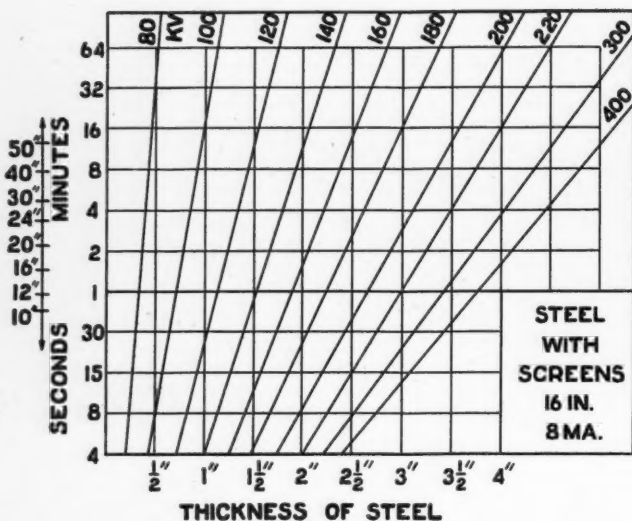


Fig. 1—Chart of Exposure Curves, for Latest Type of Ray- and Shock-Proof, Air-Insulated, Water-Cooled X-Ray Tube

the undesirable long-wave radiation. By such filtration the penetrating power of the rays is increased and practically all scattering is eliminated, thus making for better contrast and definition in the exographs. These

peak capacity. This would limit usefulness to a maximum penetration of $3\frac{1}{2}$ in. of steel, according to the charts. However, the tubes can be operated at 10 ma. which raises the total thickness of steel to about

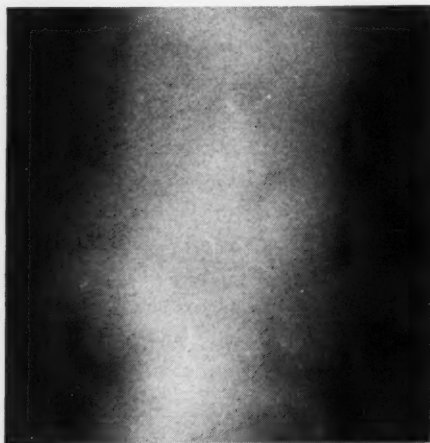


Fig. 2a and 2b—Two exographs of the same subject, taken from different angles so that the limits of the defects can be correctly ascertained.

improvement over the Coolidge tube enable us to work faster. A set of exposure curves will work with the new tube is produced in 1.

For best results, the exposure time should never be less than one minute. In order to protect the tube properly, no exposure should be longer than ten minutes when running the equipment at its

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Save Set-Up Time

Simplicity---Efficiency---Speed

Simplicity of adjustment is one feature of ALCO Drill Chucks and ALCO Tap Holders. One wrench and a simple twist does the trick. To make a change in the size of a drill or tap is a simple one-wrench operation.

Though a simple operation, and there are no bushings to bother with, the adjustment is positive; absolute concentricity is assured; and think of the time saved, since you don't have to look for the special size bushing required to make the change.

Speed in changing from one size drill or tap to another is the result. And don't overlook the more accurate work these tools do. You simply cannot afford to neglect a thorough investigation. Write today for full particulars to Alco Tool Co., Bridgeport, Conn., U. S. A.

ALCO EFFICIENT TOOLS

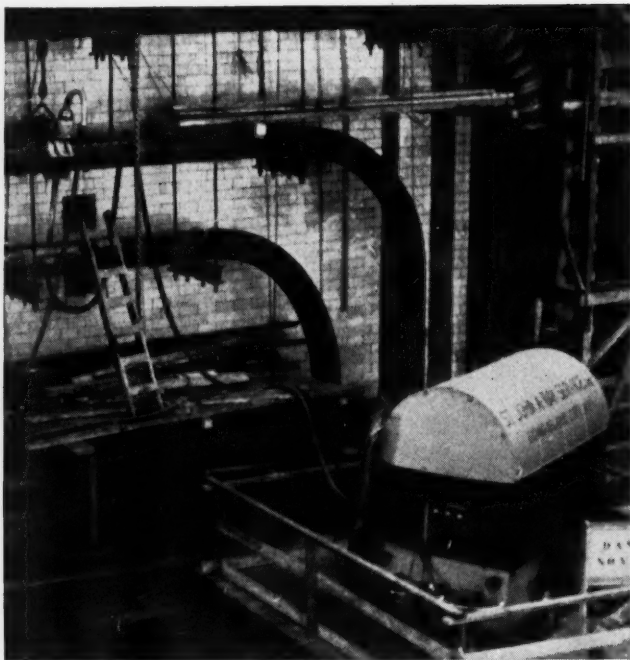


Fig. 3 — Portable X-ray unit in operation. The tube, positioned in front of a section of a pipe line, is located just above a ladder and the holder can be suspended on the opposite side of the pipe.

four inches. Above that thickness it is advisable to use gamma-rays. For various focus-film distances the scale to the left of the curves should be consulted. If the required exposure time at 16-inch focus-film distance is two minutes, for instance, and the correct time for 40-inch focus-film distance is required, we multiply 2 minutes by 8 minutes and find the correct

special method which permits a double view of the defects inside weld metal. In that way we are able with some experience to determine where the flaws are located and they should be repaired. Two exposures are necessary for each section. In each case the X-ray tube is lined up approximately parallel to the bevel of each scarf of the welded joint.

time to be minutes.

An important and interesting application of which this portable X-ray equipment has been put is in the examination of field-welded joints in pressure piping. Welds are X-rayed by

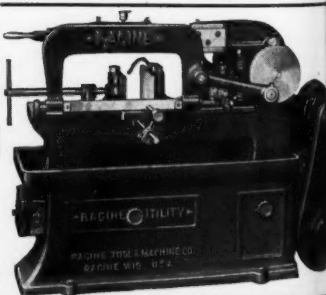
RACINE

The New Utility Saw--Hydraulic Feed

High efficiency at a remarkably low price.

"Standard the World Over"

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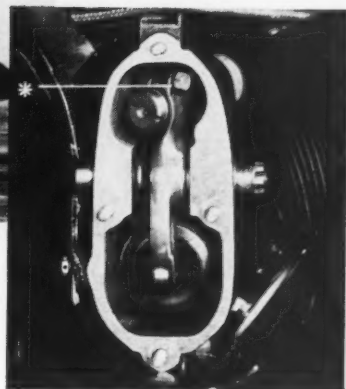
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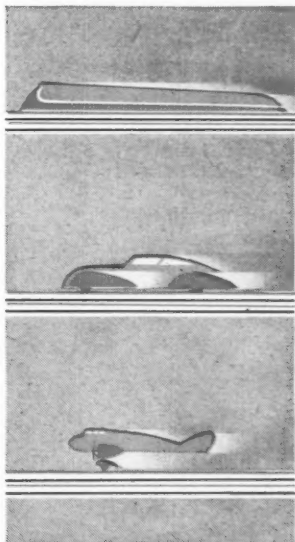
American Airlines Specify

EVERLOCK WASHERS



* THIS IS THE ROCKER ARM ASSEMBLY

washer has been selected as standard equipment on the rocker assemblies of all American Airline Flagships. The rocker arm assembly operates about 1,000 times a minute and must stay in adjustment for approximately 85,000 miles before readjustment. The action of the rocker arm assembly at this point is safeguarded by Everlock washers. Surely, our washer can fit in equally on your job. Send for free samples today.



HOMPSON BREMER & CO.
40 West Hubbard St., Chicago, Illinois

HER WASHERS HAVE BEEN TRIED—NOW EVERLOCKS ARE SPECIFIED

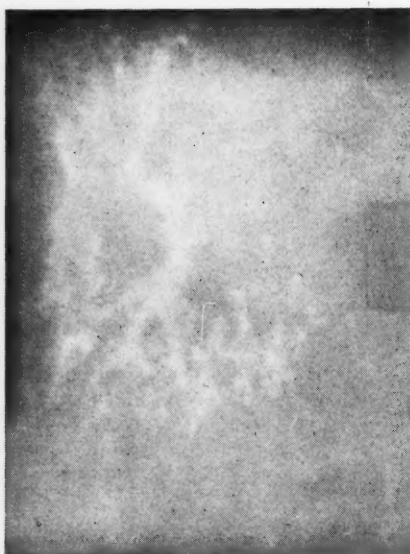


Fig. 4—Exograph showing defect in pipe. This is the exograph that was shown in process of being taken in Fig. 3.

The two resulting exographs show, as in Figs. 2a and 2b, the existing conditions from two entirely different angles. Hence the actual depth of the individual defects can be determined quite accurately. Fig. 3 shows an interesting set-up of the unit. Here the tube is quite a distance away from the machine and the film holder can be seen on the opposite side of the pipe joint from the tube.

Not only should welded structures for impor-

tant installations and buildings inspected by X-ray examination, but also castings and forgings which are subjected to severe service. X-ray inspection is the only means proving beyond any doubt the soundness of materials and workmanship. Castings and forgings can be examined in the rough. In fact, pilot castings are being X-rayed before a mold is put into production. If defects like the one shown in Fig. 4 are found to exist, changes of the mold practice or changes in gates or vents should be made to prevent the shrinkage cracks or to ensure that they will come where they cannot do any harm. Once a sound casting has been turned out from such a corrected mold, all the following runs tend to be perfect. The greater the production from a single mold, the more important—and incidentally the cheaper—is the X-ray control. Thus perfect die castings should be developed by means of X-ray examination before a new die is being used. Fig. 5 is an exograph of a portion of a large

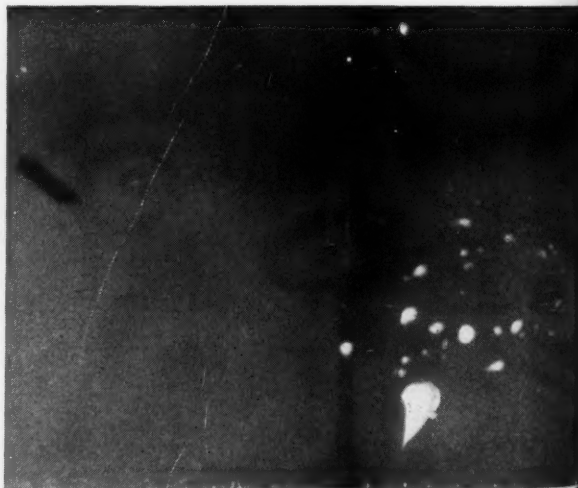
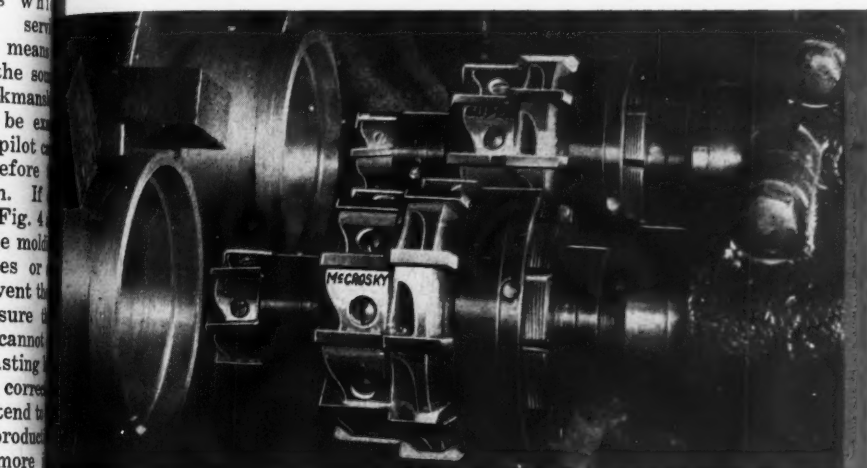


Fig. 5—Exograph of portion of a large zinc-base die casting. The white spots are blow holes, and the dark spot is an impurity of metal having a higher atomic weight than the casting metal.

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YOU can have compact standard SUPER Shell Reamers with large straight holes for mounting in series on sturdy line reaming bars . . . or the SUPER design can be readily adapted to special-purpose reamers with two or more cutting edges to the blade.

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You can get standard **PROGRESSIVE** Shear Cut End Mills for nearly every end milling job.



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base die casting. It shows blow holes (white spots) and a higher than weight impurity (dark spot). The irregular shades over the entire surface indicate the poor and uneven die

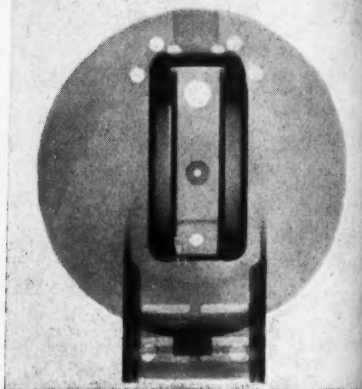
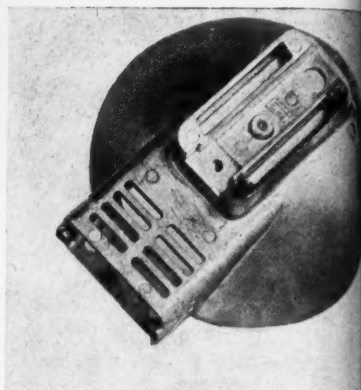


Fig. 6a and 6b—These illustrations are reproductions of a photograph and an exograph of the same object. The exograph shows the casting is sound.

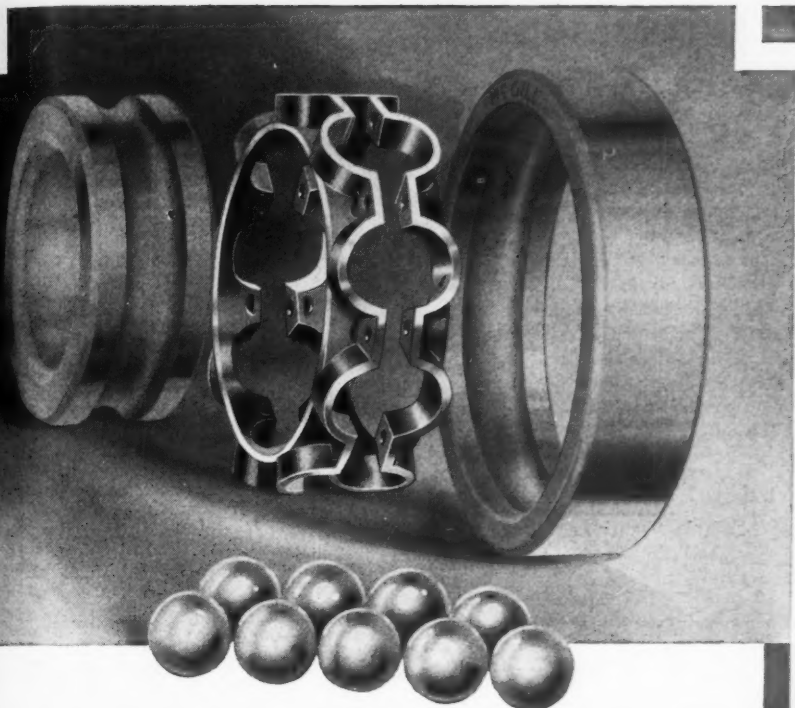
bution of the metal. A perfect sound die casting is illustrated in Figs. 6a and 6b. At a is shown a photograph and at b an exograph of the same object. Such pictures have been used successfully by sales

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BRONZE RETAINERS

Mean Much in Bearing Service

Bronze ball retainers mean least friction because bronze offers least resistance to steel. Bronze dissipates heat quickly. Bronze also prevents crystallization, a common cause of failure. Bronze means quiet running, too. Only McGILL Ball Bearings have *bronze retainers*.

Note, incidentally, that McGILL retainers have cy-

lindrical ball pockets, not spherical. This means minimum contact or wear between the balls and pocket walls—preventing the balls from wearing out of round or undersize.

McGILL Ball Bearings come absolutely clean, properly greased, wrapped in oiled paper, individually boxed and plainly marked.

McGILL MANUFACTURING CO.

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men to sell their products.

These applications are a few out of many in machine shop practice where X-ray examination can be of great help. The radiologist does not know all of them. He can only offer his equipment and experience to the manufacturer or machinist who, in turn, should present his problems to an expert who may be able to help him. X-ray inspection as a means of modern product control is more and more recognized, and as new refinements like the ones discussed above are being developed, new and more important applications will be found. X-ray controlled production creates confidence and increases business.

Light Conditioning

(Continued from page 114)

of achieving that end.

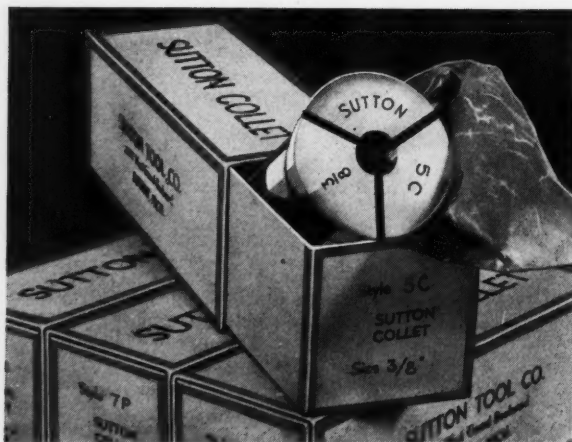
The beneficial effects of good lighting on 75 per cent of the production

budget is, therefore, undeniable. Even on the remaining 25 per cent of the budget, which goes to cover the miscellaneous expenses of plant operation, such as advertising and sales costs, insurance, taxes, employees' welfare, depreciation and maintenance, adequate lighting has a direct and beneficial bearing.

"The Advantage Is Also Yours" is the title of a broadside now being distributed by the Chicago Rivet & Machine Company, 1846 South 54th Ave., Chicago, Ill., to introduce to the trade the new Chicago Quadruple Automatic Rivet Setter. The outstanding feature of the machine is its capacity to feed, insert and clinch four rivets with each push of a button. The Chicago Quadruple is said to permit additional applications of tubular and split rivets in the assembly of a wide variety of products. Copy free upon request.

Please mention MODERN MACHINE SHOP when sending inquiries to advertisers. Your cooperation is appreciated.

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LATHES and MILLING MACHINES

Spring tempered
to give long and accurate
service.

Threads chased
to uniform size with single
point tool.

Precision ground
inside and out on hard
ened arbors.

Made by the developers of Sutton DIAMOND-GRIP Collets for screw machines. Send for circular of SUTTON COLLETS for all makes of lathes and milling machines.

SUTTON TOOL CO.

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"NOTHING BUT THE FINEST," says "G E"



Finishing Room —
General Electric
Plastic Department

In equipping their new million dollar molding plant at Pittsfield, Mass., General Electric Company made no compromises. Nothing was spared to make the Plastics Department the finest, largest and most modern molding plant in the plastics industry.

This high equipment standard pointed in but one direction when files were to be chosen. Nicholson File Company files were chosen for the important tool room work of manufacturing steel molds, which must be precision-made — and for constant production cleaning flashes and fins from molded parts.

We are proud of our contribution to efficiency at this General Electric plant. And to thousands of plants everywhere, who rely on Nicholson, Black Diamond and McCaffrey Files for top performance. At mill supply jobbers' everywhere. Nicholson File Company, Providence, R.I., U.S.A.





FRANK A. SHULER
President A.S.T.E.

Machine, Tool and Equipment Show

to be held by American
Society of Tool Engineers
at Convention Hall, Detroit,
March 9 to 12, 1938

TIMED to coincide with the beginning of peak buying seasons in mass production industries, for machinery, tools, production equipment and materials, a Machine and Tool Progress Show, national in character, is scheduled to open at Convention Hall, Detroit, March 9th.

While plans for the show have been progressing for some time and dozens of reservations for exhibit space have already been received, general announcement has been withheld until the success of the exhibit became assured.

The Show is sponsored by the American Society of Tool Engineers in connection with its first annual convention. From present indications, it should represent one of the widest ranges of industrial equipment ever assembled, including such items as abrasives, grinding equipment, air conditioning, compressed air equipment, metal removing and metal finishing machinery, tools of every variety for cutting or assembly, air or electric operated, etc. Material handling equipment, the latest in conveyors and hoists, will be represented.

In the heat-treating field, exhibits are scheduled to include furnaces, pyrometers, and automatic controls.

Plastics and plastic production equipment as well as metal spraying equipment are included in the show, as are paints, oils, and greases, and equipment for handling these materials. Other types of classifications include: alloy castings, die sections, steels and other materials, welding equipment, blowers, electrical equipment, gages, weighing and testing equipment, chucks and collets, drafting materials and supplies, pumps, hydraulic mechanisms, riveting equipment, trim equipment, safety equipment, wrenches and hand-tools, and so on.

Organized as recently as 1932, to provide a technical organization for production men responsible for the use of machines, tools, and equipment in mass production industries, the A.S.T.E. has grown speedily, doubling its membership in each of the past two years with 14 chapters covering almost the entire Industrial East. During 1937 alone, six new chapters organized and joined the Society,

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while three more are scheduled to get under way with their first meeting in January.

As the result of the rapid growth of the A.S.T.E. and its widening scope, embracing many industries, it was decided to hold the Society's first national convention in March of this year, bringing together in Detroit hundreds of manufacturing executives, master mechanics, tool engineers, tool supervisors, machine, fixture, tool and die designers and others for a four day technical session.

With 70 per cent of the A.S.T.E. membership represented by those controlling use and purchase of equipment and materials, it was felt that recent developments in equipment and methods should be brought together so that members of the society could learn at first hand what new developments were available — prior to the peak buying season.

It was felt also that such a show, if it could be put over at this time, would be of material benefit in helping break through the present business recession by stimulating the desire to purchase new equipment. Now that the success of the show and convention seem assured as the result of the flood of reservations from organizations having individuals as members of the Society, exhibit space has been thrown open—within the limitations of Convention Hall—to industry at large.

In announcing the show and annual convention, Frank A. Shuler, Master Mechanic, Chrysler Corpora-

tion and President of the A.S.T.E., said:

"Many millions of dollars will be spent by our members during 1938, toward the end of improving both ability to produce and products themselves. We believe that through interchange of technical information such as the A.S.T.E. now provides

for production men, a better direction of spending efforts will be possible. In this connection we feel that the machine, tool, and equipment show, scheduled for March will be a major help in bringing to our members' attention valuable aids for solving their own problems."

The program for the annual meeting has not as yet been announced. It will be climaxed, it has been learned, however, by a dinner at which the speaker will be a figure of national prom-



FORD R. LAMB
Executive Secretary A.S.T.E.

inence.

The national convention will be under the direction of the executive committee, composed of Shuler, Luke E. Beach, Assistant Master Mechanic of Packard; Walter F. Wagner, Master Mechanic, Lincoln Motors Co.; C. R. Brunner, Tool Engineer, Dodge Brothers; Frank R. Crone, of Lincoln, and Ford R. Lamb, Executive Secretary of the A.S.T.E.

James R. Weaver, chairman of the Pittsburgh Section and Director of Equipment, Westinghouse Electric & Mfg. Co., is in charge of the program, with J. A. Siegel, Packard Motor Car Co., in charge of entertainment, and Mr. Lamb as chairman of the committee in charge of the exhibits comprising the show.

N. I. A. A. to Hold 1938 Conference in Cleveland

THE National Industrial Advertisers Association will hold its 16th annual conference in Cleveland, Sept. 21-23, 1938. This association is the only national organization primarily devoted to the interests and development of industrial and trade advertising. Last September the association surpassed all its former attendance records with a registration of almost 800 at the Edgewater Beach Hotel in Chicago.

F. O. Wyse, advertising manager of Bucyrus-Erie Co., South Milwaukee, who at that meeting was elected N. I. A. A. president for the current year, characterized the whole year of 1937 as the busiest year of growth and expansion of activities in the as-

sociation's history, since its formation in 1922.

Three new chapters were added in Toledo, Toronto and Indianapolis and a dozen different research and development projects were carried in addition to the separate activities and monthly meetings of local chapters now being held regularly in cities.

Typical of some of these national committee activities was the recent development of publishers' forms in three classifications of business papers, developed to provide more detailed and comparable data for subscribers and including editorial, qualitative information, as well as additional industrial coverage and circulation data. Another report recently issued covered the influence of local dealers on the buying space in trade papers.

"Few plans are being made for the 1938 conference program," Knisely said, "until a canvass of the membership indicates what subjects it will be most desirable to present and discuss at that time."

GRAY TURRET HEAD METAL CUTTER OR NIBBLER



Cuts all metals any shape—30 gauge up to 1".

GRAY, Originator of First Practical Metal Cutter or Nibbler.
GRAY Cutters Still Lead.

GRAY MACHINE CO.
Dept. A, P. O. Box 596,
Philadelphia, Pa.



CRANK SHAPERS HEAVY DUTY

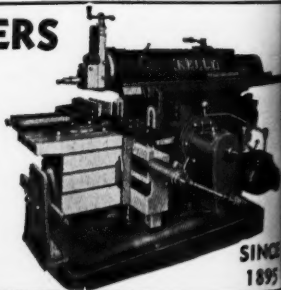
Made exclusively in the HEAVY DUTY TYPE.
KELLY Shapers are guaranteed by the manufacturer for satisfactory performance, accuracy, material and construction. Sizes 16" to 36" stroke.

Write for catalog.

GENERAL ENGINEERING & MFG. CO.

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SINCE 1895

PRODUCTION PROBLEMS ARE LARGELY TOOL PROBLEMS

... and the principal tool problem is the STEEL PROBLEM



TRADE MARK REG. U.S. PAT. OFF.

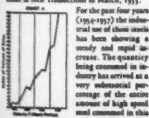
MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL

has been meeting the most severe production requirements for years. Leading Steel Companies in North America and Europe are now licensed to make MO-MAX

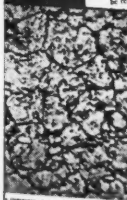
THE MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL MARKETING UNDER THE GENERAL TRADE NAME MO-MAX

By J. V. Egan
Marketing for
The Cleveland Twist Drill Co.

The following description of the Molybdenum-Tungsten high speed steel was presented to the American Society for Steel Treating at their Boston Convention in October, 1931, and published in their Transactions in March, 1932.



[1]



A comparison of the surface of a tool made of Molybdenum-Tungsten high speed steel with that of a tool made of ordinary high speed steel. The former is shown in the foreground and the latter in the background.

[2]

STARTING TO USE MO-MAX

A change to a different type of tool material, even if the differences are slight as in the present case, does not mean the exercise of some change and it is not a simple matter to make a change.

Table No. 2 Revised "C" Hardness of Tool Steels Based on Five Carbon Content Showing Effect of Varying the Hardening and Tempering Temperatures

Carbon	Annealed		Quenched	
	Hardness	Temp. (°F)	Hardness	Temp. (°F)
C	100	1000	100	1000
Cr	100	1000	100	1000
Co	100	1000	100	1000
Fe	100	1000	100	1000
W	100	1000	100	1000
Mo	100	1000	100	1000
Ni	100	1000	100	1000
Mn	100	1000	100	1000
P	100	1000	100	1000
S	100	1000	100	1000

On tools which cause to ground after tooling, procedure should be taken to prevent deterioration or softening. The methods of doing this are well-known and include the use of special fluids designed to produce a non-oxidizing atmosphere, various salt baths, etc.

[3]

These steels have a much more stable and better of clean and smooth carbon steel, or the JPS-Tungsten steel.

The Red Hardness or the Hardness of Molybdenum-Tungsten high speed steel is similar to that of the Red Hardness of the steel which has been made with Molybdenum-Tungsten high speed steel.

REMARKS AND OBSERVATIONS

The observations that have been made on Molybdenum-Tungsten type of steel are as follows:

1. The Molybdenum-Tungsten type of steel is an excellent high speed steel.

2. The Molybdenum-Tungsten type of steel is an excellent high speed steel.

3. The Molybdenum-Tungsten type of steel is an excellent high speed steel.

4. The Molybdenum-Tungsten type of steel is an excellent high speed steel.

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9. The Molybdenum-Tungsten type of steel is an excellent high speed steel.

10. The Molybdenum-Tungsten type of steel is an excellent high speed steel.

THIS NEW EDITION

of the booklet shown contains the latest data on Molybdenum-Tungsten High Speed Steels and a microscopic comparison with 18-4-1 under different heat treatments. Write for your copy to THE CLEVELAND TWIST DRILL CO. CLEVELAND, O.

SHIFT TO MO-MAX FOR QUALITY AND QUANTITY PRODUCTION

MO-MAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company and its only licensed users are others in on steel made and sold by licensees under U.S. Patent Nos. 1,937,334; 1,998,953; 1,998,954; 1,998,955; 1,998,956; 1,998,957 and Canadian Patent Nos. 346,506; 364,032 and 364,033.

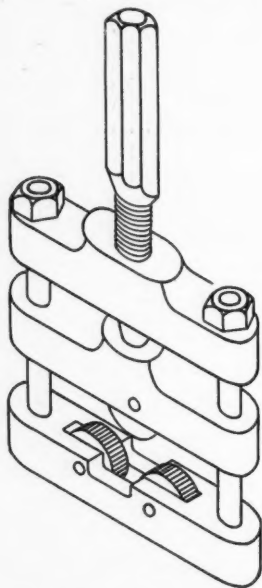
Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Hand Knurling Tool

BY CHARLES H. WILLEY

THERE are many cases where a knurling tool that could be used in a drill press or lathe without having to employ a toolpost would come



Drawing of Hand Knurling Tool

in handy. Having need for such a tool on several occasions, we finally made one which served admirably. The construction of the tool is illustrated in the drawing.

Three knurls are used, one being carried in one of the cross-pieces and two in the other so that the work can

be gripped between the three points of contact and the operation of the tool thus simplified. The center cross-piece, in which the single knurl is located, slides freely on the two posts and pressure is applied to this cross-piece by means of the hexagon handle. The handle is threaded through the end cross-piece so that the pressure can be applied by revolving the handle.

The tool can easily be slipped over the end of a shaft or other piece of work if one end of the work is free. If the work is held between centers or the end is otherwise obstructed, one side of the tool can be opened by unscrewing one of the posts, removing it, and then screwing it in again when the tool is in position. The tool can be used to knurl a piece of work held in the vise, using the handle to revolve the tool about the work.

Screw Plug and Slide Type of Adjustable Micrometer Boring Bar

BY JOHN A. HONEGGER

THE drawing illustrates the design of a micrometer boring bar in which the adjustment is obtained by means of a knurled micrometer screw operating in a plug, the plug transferring its motion to a thin slide which, in turn, transfers its motion to the tool slide.

The tool consists primarily of two bar A, in which the square hole has been broached to receive the slide B, in which the toolbit is locked

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Strictly High-Speed, these patented combination blades are also **positively unbreakable**. They permit greatly increased running speeds, for heavier feed pressures, and can be tensioned much tighter than other blades because the hardened "eyes" in their tough alloy steel body will not pull out. No matter what hack saw equipment you use, you can safely run at full capacity with MARVEL High-Speed-Edge Blades.

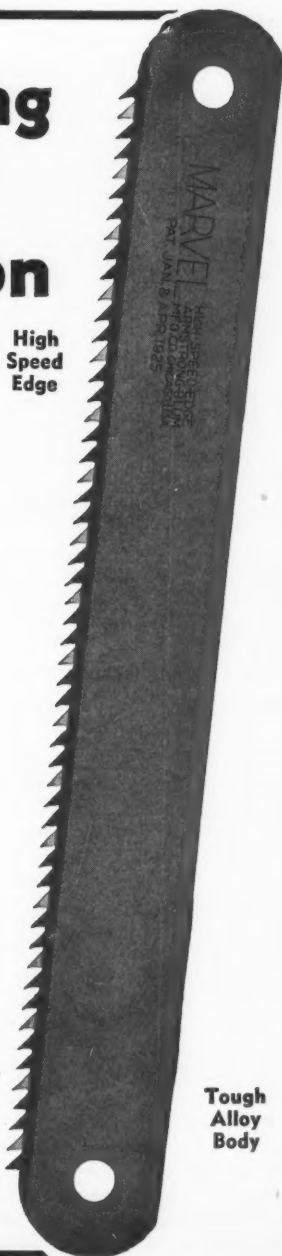
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Armstrong-Blum Mfg. Co.

"The Hack Saw People"

5745 Bloomingdale Ave.

Chicago, U. S. A.

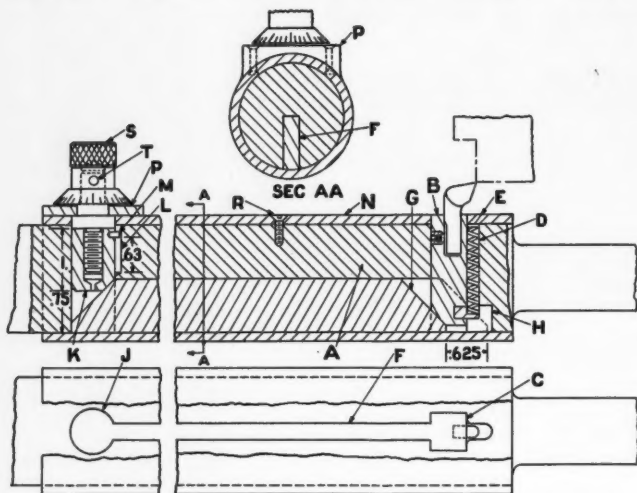


Tough
Alloy
Body

means of a headless setscrew as shown. A spring slot D is drilled for the insertion of the spring E. In the under side of the bar a narrow slot F is milled to accommodate the slide G, which is machined at an angle at each end. The slot F is machined at

parts and also to provide a base for anchoring the micrometer screw retainer block P.

After the micrometer screw plug have been assembled to the tubing, the retainer block P is riveted to the tubing as shown. Several holes are



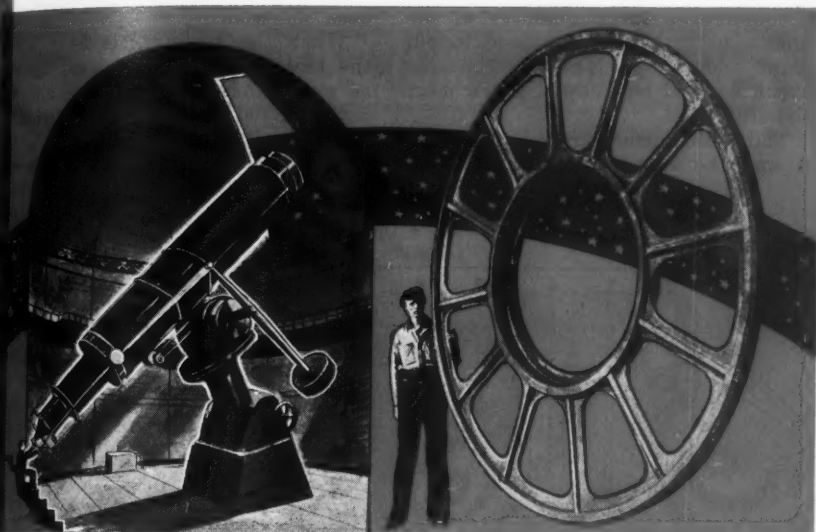
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Slowly and with extreme care, a 200-inch glass reflector is being ground for the observatory of California Institute of Technology on Mt. Palomar, California. When finished, it will become part of the largest telescope in the world. The special grinding gear for this critical task was cast of MEEHANITE, superior modern metal for extra-heavy, intricate, or otherwise difficult castings. Among the pro-

perties obtainable in MEEHANITE are high strength, toughness, uniformity, machinability, heat resistance, wear resistance, corrosion resistance. Costs are relatively low. If you are a user of metals, learn about the recent advancement in castings. Ask about MEEHANITE. Address any of the manufacturers listed below, or Meehanite Research Institute, Vandergrift Building, Pittsburgh, Pennsylvania.

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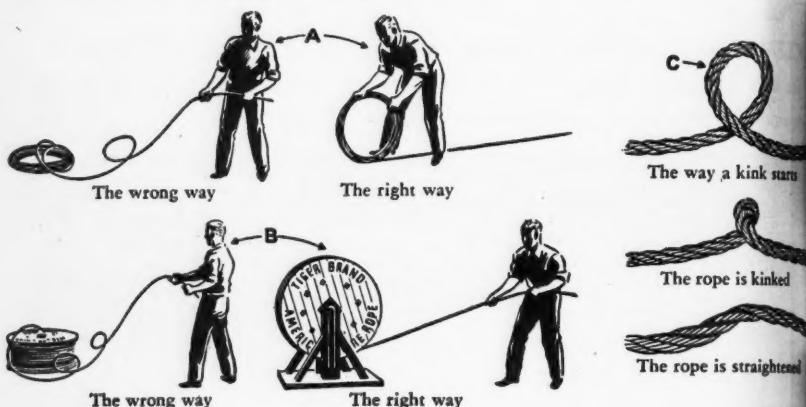
1111 Depot St.

Wickliffe, Ohio

wire cable, the cable should be handled as shown in the illustrations.

The illustration A shows the wrong and right ways to uncoil cable. The illustrations B show what happens

kink has been straightened out. The kink may be straightened fairly well and the individual wires may or may not be broken, but the damage is done. The cable has been weakened



when cable is pulled from a reel the wrong way and the correct way to mount a reel so that the cable can be removed without kinking. The illustration C shows how a kink is started, how the kink is completed, and how the cable looks after the

by short bending the wires, and when put to work the wires will soon break. To be safe, one should never use wire cable that has been kinked unless the kinked portion has been cut out and the cable spliced together again by the correct method.

(Illustrations courtesy Columbia Steel Company subsidiary of the United States Steel Corporation.)

"Have You Considered Low Temperature Brazing" is the title of a four-page folder being distributed by Handy & Harman, 82 Fulton St., New York, N. Y. The advantages and characteristics of low temperature silver brazing alloys are discussed and photographs showing the use of these alloys on different products are included. Short descriptions of Sil-Fos, Easy-Flo, Handy Silver Solders, and Handy-Flux, products of Handy & Harman, are given. Copy of the folder free to mechanical engineers or plant executives upon request.

"The Characteristics of a Modern Arc Welder" is the title of an interestingly written technical description of how modern welder design meets the requirements of present-day welding operations.

Giving volt-ampere curve analysis for general welding, heavy welding and light-gauge welding, it goes into simple current control, self-excitation and other pertinent points in the design and construction of the Hansen Smooth Welding Generators.

Written by Frank J. Hirner of the welder division of Harnischfeger Corporation, the folder helps to clear up many points that were heretofore not thoroughly understood about welder design. Copies may be had by writing to Harnischfeger Corporation, 4535 W. National Ave., Milwaukee, Wisconsin.

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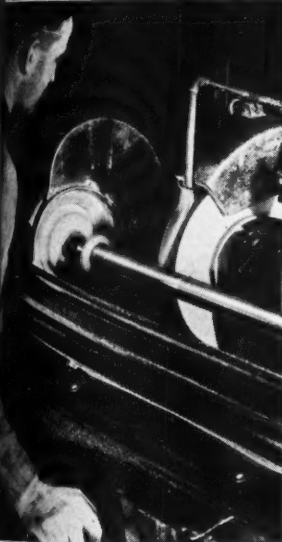
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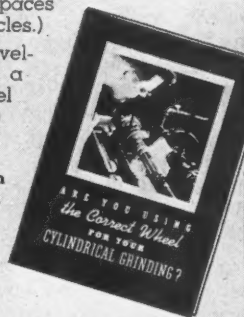
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WESTBORO MASSACHUSETTS

Over the Editor's Desk

Violating a Natural Law

AMERICA is going to learn one big lesson from the outcome of the present economic situation, and that is that there is one natural law which cannot be violated with impunity. That law is the Law of Supply and Demand.

For many years the price of gold remained practically stationary at \$20.67 an ounce, which was paid the world over. On Feb. 1, 1934, the United States Treasury raised the price we were willing to pay to \$35 an ounce, and since that time, according to Col. Percy E. Barbour in The New York Sun, we have been practically giving away—particularly to the British and Soviet Governments—millions of dollars annually which the American people will have to pay. Gold is not worth \$35 an ounce to other nations, consequently Uncle Sam has been purchasing most of the gold production of the world.

The value of gold depends, like anything else, upon the law of supply and demand and the cost of production. Eventually we are going to have to go back to the price paid by other nations, but in the meantime the people of this country are paying about \$1.75 for every dollar's worth of gold the government buys.

During the first half of 1937, at a time when production activity was at a high level, widespread wage advances were granted both voluntarily and to meet union demands. With the precipitous decline of business during recent months, labor costs, instead of dropping with the lowering of prices of raw materials as would be natural, have soared to levels higher than the 1929 period. Either labor costs have got to come down to a level consistent with the demand

or our present "recession" will continue indefinitely. How long will it take to learn this lesson?

Hidden Values

AS MRS. HOUSEWIFE does the family washing into modern electric washing machine Monday morning, she little suspects the amount of thought and labor that has been expended to the end that her washing machine may function perfectly over a long period of time. She fills the tub with water with thought of the comparatively easy degreasing and conditioning equipment through which that tub passes to the end that it might be immune to rust through thousands of washings.

She pulls the lever that starts the motor quite unaware of the engineering that made such a motor possible—bearing holes bored with a diamond to a perfect fit for ball bearings which have been finished within limits equal to $1/7$ the diameter of hair; shaft journals lapped to fit its as close as those of the ball bearings; commutator segments and motor iron produced with dies which cost more than the washing machine; gears the design of which has involved mathematics which to Mrs. Housewife would look like an explanation of the theory of relativity.

How much we—even those of us who are familiar with metal manufacturing—are prone to overlook the hidden values in our accessories of living. It seems to your editor that here is a store of selling material that is generally being overlooked. It should be possible to dramatize engineering, the preparatory operations, and the fine workmanship in a way that would open the eyes of the prospective purchaser to the hidden values in these commodities.

File for
Bulletin 3
complete s

Model

Model

ENGINEER

SIMPLE OUTSIDE ADJUSTMENT

maintains high efficiency Air Cylinder Operation

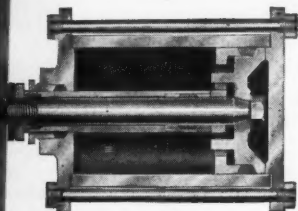
Hannifin "Leak-proof" Air Cylinder construction has the simplest outside adjustment of the piston packing. Maximum utilization of air power, without leakage, can be consistently obtained, for the original high-efficiency piston seal is easily maintained throughout the entire life of the packing.

Correct adjustment of the soft, graphite treated piston packing is made, whenever required, from the outside of the cylinder without disturbing any other parts. The adjusting nut and tube are an integral assembly, locked in position on the threaded end of the piston rod. There can be no end play as the packing wears. Adjustment requires only loosening the lock nut and turning the adjusting tube.

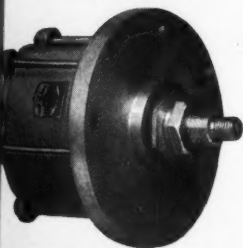
Hannifin "Leak-proof" Air Cylinders are built in a complete range of standard types and mountings, sizes 1½ to 16 in. diameter, for any length stroke. Larger sizes built to order. Single acting and double acting types, with air cushion at either or both ends if required.

HANNIFIN MANUFACTURING COMPANY
621-631 South Kolmar Avenue, Chicago, Illinois

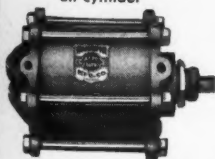
HANNIFIN IMPROVED AIR CYLINDERS



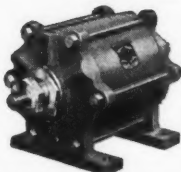
Sectional view



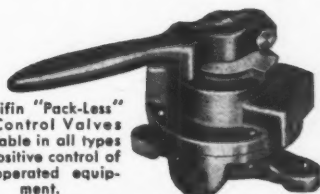
Model JR—double acting
air cylinder



Model BR—double acting
air cylinder



Model CR—double acting
air cylinder



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available in all types
for positive control of
air operated equip-
ment.

ENGINEERS • DESIGNERS • MANUFACTURERS Pneumatic and Hydraulic Production Tool Equipment

New Shop Equipment

Landis Dual Wheel Carriage Type 30 Roll Grinder

Some time past the Landis Tool Company, Waynesboro, Pa., designed and built a Dual Wheel Carriage Type 30 Roll Grinder to grind rolls of exceeding hardness from the rough without the usual turning operations. The roll is finish ground on the same machine by the use of a second wheel carriage. Another similar machine has now been installed to semi-finish and finish grind conventional type of rolls. There are, however, certain interesting differences between the two machines.

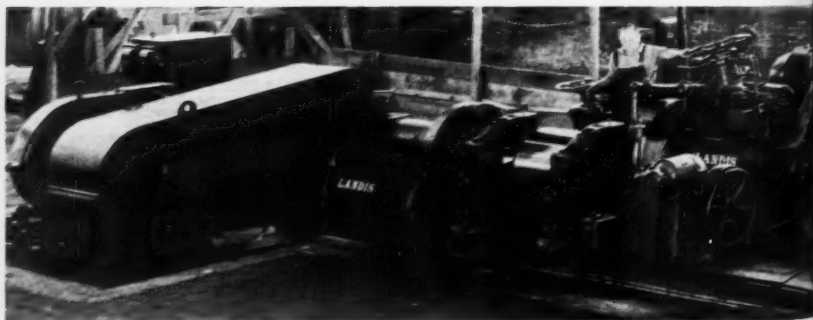
The machine is 36x168 in. in size. The rear bed section has extra length so that two standard wheel carriages may be mounted on it. Either carriage will grind a roll the full capacity of the machine without interfering with the second carriage—which is always out of the way at one end of the bed. The use of a machine of this kind makes it unnecessary to move the roll from one machine to another; thus no valuable time is lost changing wheels. The tracking of the finishing wheel head, necessary due to the fact that the majority of the rolls are crowned or concaved during the semi-finishing and finishing operations, has been found under test to be within a close degree of accuracy.

The machine is equipped with the new work drive which has been adopted for all Standard Type 30 Roll Grinders.

This drive consists of the conventional work drive motor mounted on a base at the left hand end of the machine where it is direct connected to a speed reducing unit. From this unit to the end of the headstock spindle the drive is through a silent chain. The drive is compact and as the entire base which supports it does not come in contact with the bed, any vibration picked up by the base will not be transmitted to the bed. The drive may be supplied mounted at the same approximate position as the machine or in a covered position. Under some circumstances a multiple V-belt drive may be had instead of a chain.

Certain separate electric control features are employed. All motors for complete operation may be controlled from the wheel carriage and the wheel carriage motors are inter-locked so that they can not be operated simultaneously.

The machine weighs approximately 185,000 lbs. including all electric equipment. Fifteen electric motors with a total of 96½ h.p. are used. They include two traverse drive motors, two water pump motors, two rapid traverse wheel head cross movement motors, two wheel spindle oil pump motors, two wheel carriage oil pump motors, two wheel drive motors, work drive motor, footstock traverse motor, and center grinder motor. The wheel drive motor of the semi-finishing carriage is 850 to 1700 r.p.m. and the one on the finishing carriage is 600 to 1800 r.p.m.



Landis Dual Wheel Carriage Type 30 Roll Grinder

Machining
Brinell 265
ror fin

Vascoloy
Grade

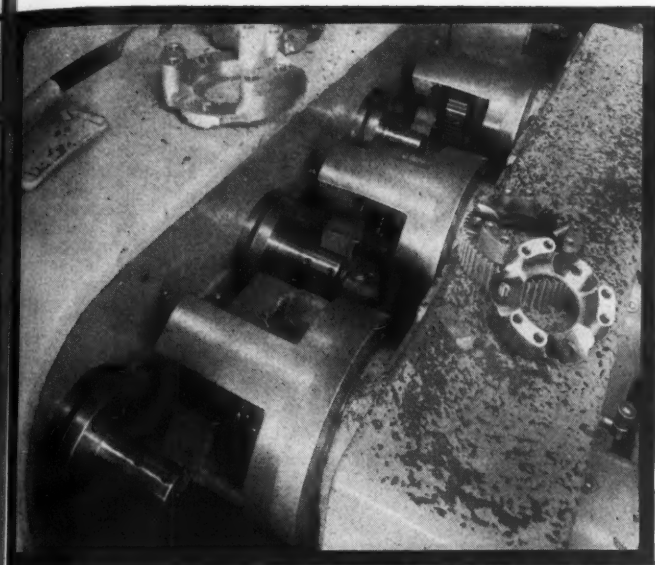
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Courtesy Buick Motor Co., Flint, Michigan

Machining front and rear carriers of unit clutch hub. Material: steel forging S.A.E. 1340, Brinell 269-316. Operations: finish 3 faces on each piece, intermittent cutting, producing mirror finish, tolerance plus or minus .001". Performance of V-R, Grade DW tools:

Vascoloy-Ramet	Depth of Cut	Feed	Speed	Cut'g Time (3 faces)	Per Tool Grind
Grade DW	.010"	.005"	389 S.F.M.	.86 Min.	105-120 Faces

Steel forgings with Brinell hardness 269-321, intermittent cutting to a tolerance of plus or minus .001", producing a mirror finish—these requirements test the rugged ability of any tool material.

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VASCOLOY-RAMET DIVISION
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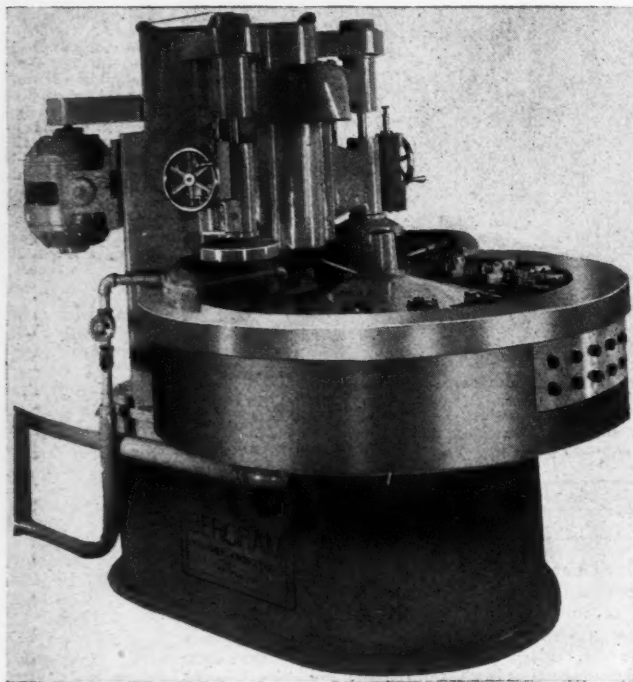
Bergram Type SG-1 Production Surface Grinding Machine

The Bergram Type SG-1 Production Surface Grinding Machine illustrated has been brought out by the Bergram Mechanical Engineering Co., New Britain, Conn., to meet the demand for a

or push button control feed for the wheels. Grinding wheels from 8 to 38 in. in diameter can be accommodated on this machine. The work table is 38-in. diameter. The machine shown is arranged for wet grinding with water holding fixtures which close during the grinding portion of one revolution and

open for ejecting or loading for the remainder of the revolution, thus eliminating necessity of stopping the work table during the production cycle.

The machine can be arranged to handle work-pieces of any height. For facility in setting up or changing over from one job to another, complete assembly of fixtures is permanently mounted on a ring which as a unit is bolted to the table so that it can readily be removed and replaced by any other unit. The spindle and base are of welded steel construction, designed with internal ribbing to provide maximum rigidity and minimum deflection. Stresses have been relieved in all welded units assuring maintenance of alignment.



Bergram Type SG-1 Production Surface Grinding Machine

machine of greater capacity and higher production possibilities than its previous Type DG-1 Machine. Automatically operated fixtures of a number and type determined by the nature of the work are mounted on a revolving table which passes underneath the grinding wheels for stock removal in selected steps to a uniform height. The grinding spindles are driven by individual motors through variable speed devices and the table also is individually motor driven through a variable speed device, thus providing for selection of the proper work speeds and wheel speeds as required by wheel quality and nature of the material to be ground.

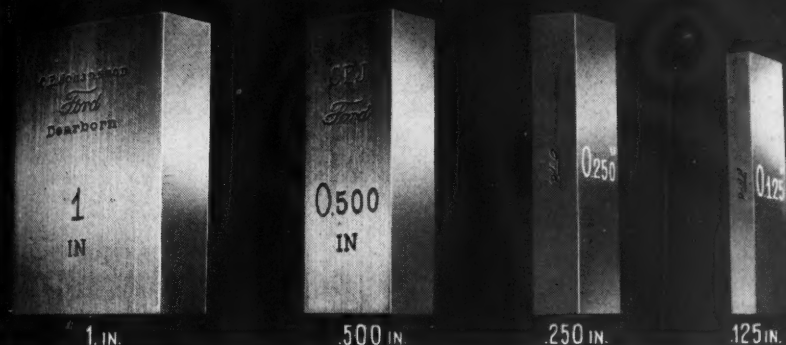
Provision is made for hand, automatic

Liberty Openside Planer

All the latest features of planer design are said to be incorporated in the Liberty Openside Planer illustrated herewith and placed on the market by The Liberty Machine Tool Company, Hamilton, Ohio. The utmost in flexibility, accuracy and efficiency is said to have been obtained through the type of construction and position of the multiple controls.

Overhead machinery has been eliminated and no part of the machine extends below the floor line. Design simplification has also eliminated a great many unnecessary parts such as shafts

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They may be purchased singly or in sets. Individual blocks of B quality—accurate to $\pm .000008$ inch—cost only \$6 for 1-inch size; \$5 for .500 inch; \$4.50 for .250 inch; \$3.50 for .125 inch. When so much

depends upon precision—and Johansson Gages cost so little—it is inefficient to use inferior means of measurement. Further information, including additional prices, is in

Catalog No. 12.

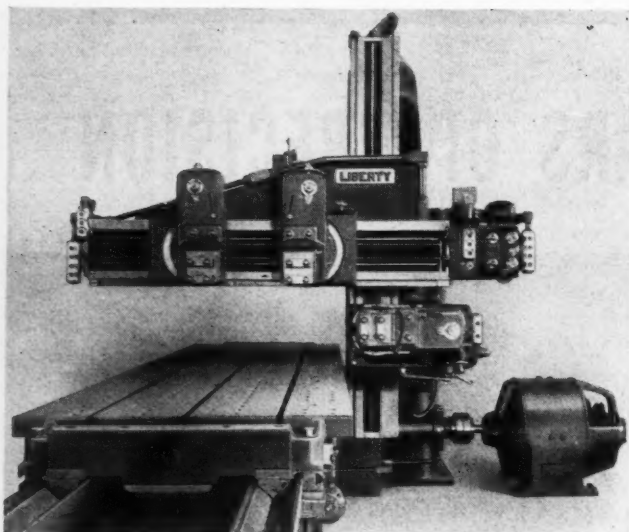


WRITE TO

FORD MOTOR COMPANY

Johansson Division

Dearborn, Michigan



Liberty Openside Planer

gears and clutches, this advantage being obtained by applying all motors direct. The rail motor, for instance, is built into the back of the rail and is used for power rapid traversing the heavy offset side heads vertically and tool slides horizontally, and also for electric feed of same.

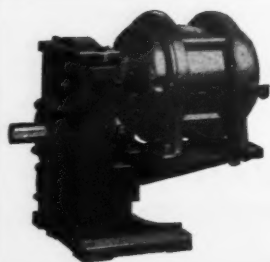
Another feature of the planer is that all screws are stationary and are stretched into tension, making these screws much more rigid and of longer life. Ball bearing nuts are revolved on these screws. A single stationary screw in the rail carries both heads. The screws for elevating and lowering the tool slide are also stationary and are operated by revolving nuts supported on

ball bearings. The stationary screws for elevating and lowering the rail are secured by key and nut at each end of screw. All nuts are of bronze and are easily renewable.

The improved motorized clamping device makes it possible to clamp, adjust and reclamp the rail without necessity of the operator moving from his working station. The design of the clamping device is such that the load is taken on the rail, eliminating the possibility of chatter between the rail and housing. The housing is of massive construction and is

attached to the bed. All gearing in the feed mechanism, power rapid traversing device and main gears in the bed run in a bath of oil. The shafts in the bed all operate on Timken roller bearings, minimizing power consumption and eliminating possibility of frozen bearings.

The outstanding feature of the machine is the rigidity of the main housing and scientific method of motorized clamping which has precluded the possibility of weakness at the unsupported end of the rail and insures production and accuracy comparable with a two housing planer besides having the advantage of greater clearance for tool work.



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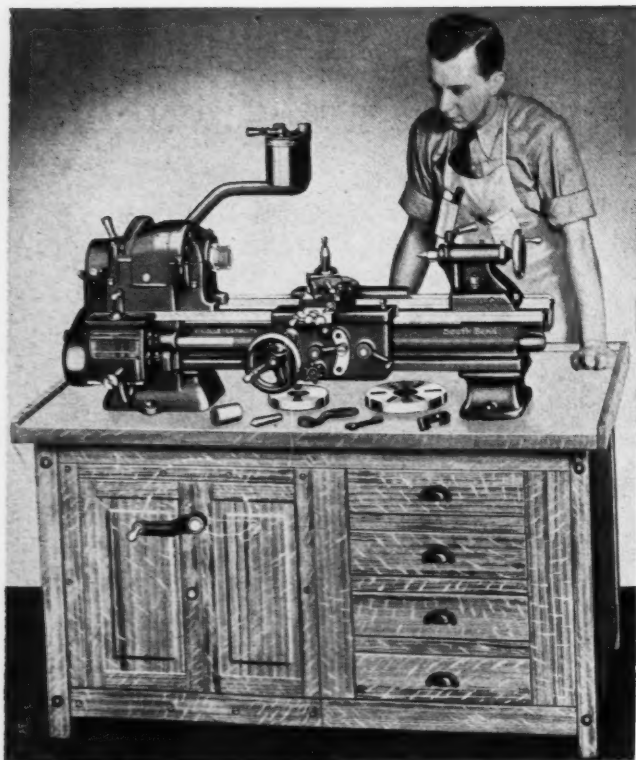
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UNION COLD DRAWN STEELS



South Bend Series R 1-In. Collet Lathe

South Bend Series R 1-In. Collet Lathe

A 9-inch swing lathe with a $1\frac{1}{4}$ -in. hole through the spindle and 1-in. collet capacity is announced by the South

tor Driven Lathe, the Tool Room Lathe, the Horizontal Adjustable Motor Driven Lathe, and the Counters

A two-speed motor drive provides twelve spindle speeds ranging from

Bend Lathe Works, South Bend, Indiana.

This is a geared, screw cutting lathe with all engine lathe features, and has been developed especially for manufacturing plant and the home room. All regular attachments are available. Drive collet chuck attachment may be had in the hand wheel type and quick acting type; six tool turret and dovetail tool slides on the lathe to handling multiple operation manufacturing jobs; telescopic taper attachment permitting doing the most precise taper work; electric grinding chip pan, cutting tray, carriage and milling and keyway cutting attachments are available.

The lathe is available in several different types including the Tool Room Lathe, the Horizontal Adjustable Motor Driven Lathe, and the Counters



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For circular or rotary knives up to 20" diameter. By means of triple slides and swiveling adjustment any degree of bevel can be ground. Graduated dial insures correct bevel angle setting. Unusually low price. Write for Bulletin CC.

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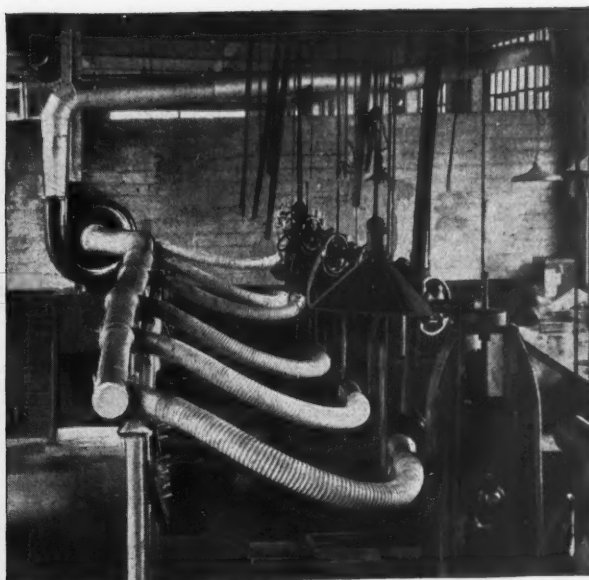
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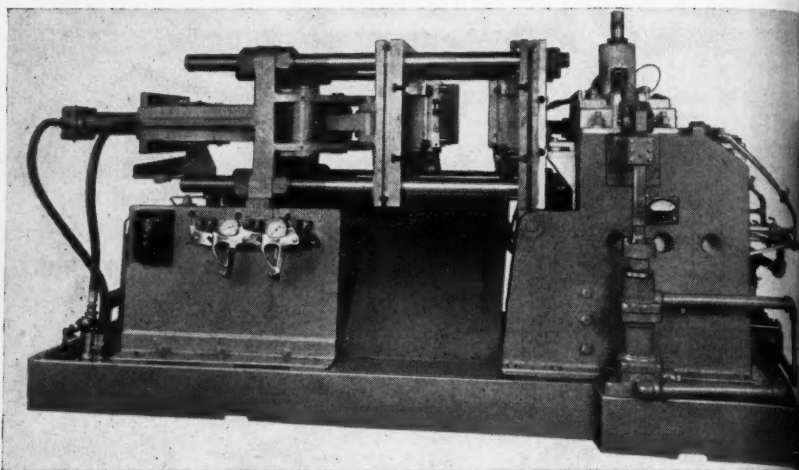


Grinders Equipped With ROTO-CLONE Exhaust System.



ROTO-CLONE

Combined Exhauster and Dust Separator



Kux-Lohner Horizontal Hydraulic Die Casting Machine

to 1400 r.p.m. The Quick Change Gear model cuts screw threads from 2 to 112 per in. and the Standard Change Gear model cuts threads 4 to 112 per in. Power longitudinal feeds are 0.003-in. to 0.020-in. and 0.002-in. to 0.015-in. respectively. Four bed lengths are available: 3-ft., 3½-ft., 4-ft., and 4½-ft.

Features of the lathe are a heat treated headstock spindle with all bearing surfaces hardened and ground, spindles of special alloy steel with phosphor bronze bearings, line bored and lapped and adjustable for wear, new double wall apron with self-oiling steel gears, and a multiple disc friction clutch.

Kux-Lohner Horizontal Hydraulic Die Casting Machine

A horizontal hydraulic die casting

machine to be known as the Model especially designed for casting lead, or aluminum base alloys, has been developed by the Kux-Lohner Machine Co., 2145 Lexington St., Chicago, Ill. The machine has a number of outstanding features. Among these is the plunger which is designed to take up wear most indefinitely and to retain the ability to hold pressure without sticking.

No strain is put on the furnace metal pot. Massive bridge construction supports the plunger gooseneck so the gooseneck is easily adjusted for good nozzle contact with the die. The hydraulic ram which operates the plunger is located at the side of the machine instead of above the pot to keep it away from the heat. The adjustable core pull mechanism, which can be placed anywhere around the die, is completely universal. Cores can



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—Foot Presses—

Made in 3 Sizes: 3"—6"—10"

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13 Sizes—Plain and Ratchet Types

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... no more lost or damaged blades due to broken-out cardboard containers.

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And this is merely a PLUS VALUE with
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STAR HACK SAW BLADES

CLEMSON BROS., INC.

MIDDLETOWN, N. Y.

pulled of any length from zero to the maximum length desired and can be pulled at any angle or at any position on the die. The core pull mechanism can be set to pull cores in either the stationary half or the movable half of the die.

The machine controls are simple and safe. Hydraulic pressure controls have been incorporated so that each phase of the casting cycle must be completed before the next one can start. Interlocking manual controls prevent the operator from moving the wrong lever. The machine is completely self-contained, requiring no air compressor except when used for aluminum casting. For zinc and lead, the machine is ready to operate when gas, water and electrical connections have been made. The machine is convertible from plunger type for zinc and lead to air injection type for aluminum. The machine is built in sizes of 12, 18 and 24 in. between the bars.

Thomas Inclinable Power Press

In addition to the adaptability which is always a feature of the open back inclinable press, the design of the Thomas Series A Inclinable Power Press is said to incorporate features which

greatly increase the usefulness of type of press, in addition to reducing tool costs and maintenance. This is a product of Thomas Machine Manufacturing Co., Pittsburgh, Pennsylvania.

The press is designed so that the die which is of fine grained alloy steel moves vertically in double 45 deg. of hardened steel. The back gibs are bolted to the frame while both the left and right front gibs are adjustable. A hardened steel key is doweled and bolted to the slide and is accurately fitted into a slot in the heavy cross member which is cast integral with the frame and tends vertically the entire length of the gibs. Oil reservoirs are cast in the frame at each side and radial outlets are provided at points throughout the entire length. A similar oil channel is provided to lubricate the sliding key at the rear of the slide, and conveyor rollers are provided for renewing the supply.

A one-piece eccentric shaft of exceptionally rigid design is used where length of stroke permits. For long strokes a heavy, well proportioned crank shaft is used. The main bearings are unusually large and are of the 45 deg. split type which transmit the thrust direct to the frame. Bronze bushings

MODERN DIE-MAKING MACHINES

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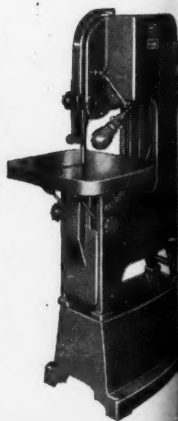
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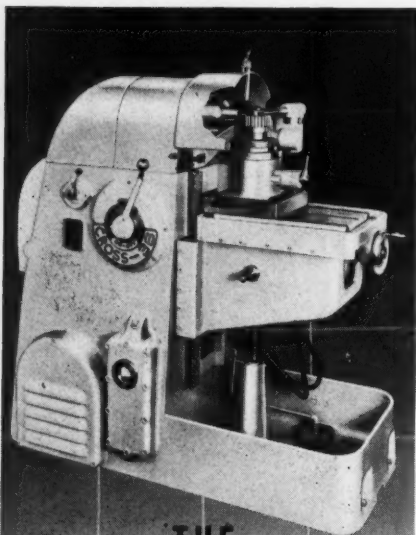
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THE NO. 36 CROSS

Latest model of the Cross Gear Tooth Rounder, a world-famous machine for twenty-five years. Unequaled in its ability to quickly produce the most exacting quality. Flexibility, ease of setup and low cost tooling are characteristic features.

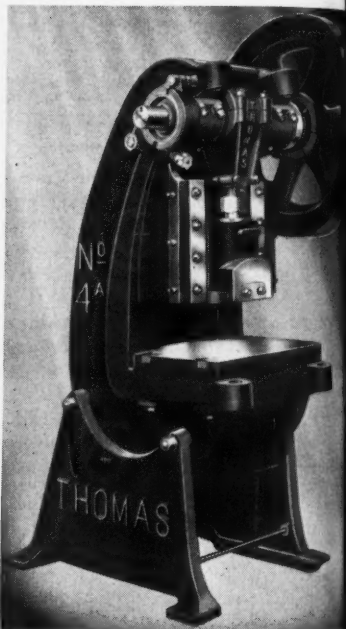
Information sent on request

CROSS GEAR & MACHINE CO.
Established in 1898
DETROIT, MICHIGAN, U.S.A.

are recommended and are supplied on request.

The patented safety clutch permits single stroke non-repeat or continuous operation as desired. The press can be locked out of operation when set dies or making adjustments. All parts subject to wear are of heat treated alloy steel and all parts are interchangeable.

The flywheel is well balanced and



Thomas Inclinable Power Press

hub is so designed that the steel die blocks can easily be replaced when worn. The flywheel can be backed up with damage to the clutch mechanism. Movable guards are provided to conform with safety regulations.

The frame is of alloy iron, well seasoned and of high tensile strength. An exceptionally rigid section has been secured without excessive weight and deflection has been reduced to the minimum. The massive one-piece frame is connected with the slide by means of a buttress thread screw of the nut and socket type. Provision is made for a knock-out bar in all presses. An elevating screw is provided for inclining the presses in all sizes where the

To Men

"WITH A CHIP ON THEIR SHOULDERS" when buying Flat Wire

FRANKLY, we welcome an opportunity to cooperate with hard-pressed buyers of cold rolled steel wire—men who lay down exact specifications and demand that specifications be met.

We are set up to handle the difficult wire jobs—in fact, we specialize in this type of business. We make drawn steel in small open hearth furnaces which permit close, accurate

control of the melt. All the way through to final inspection and shipment, we are organized to provide the careful attention to details and close checking essential to difficult flat wire production.

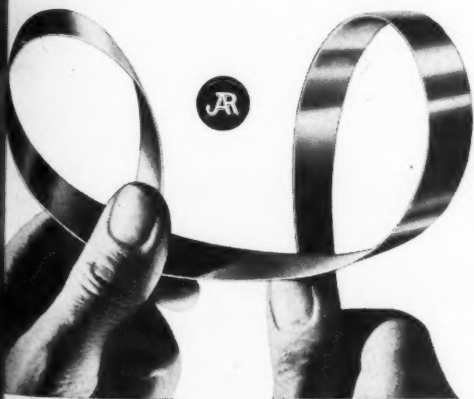
Some of our customers require great toughness and resiliency. Others put the emphasis on uniformity of temper. Still others require certain unusual deep drawing qualities. There are

dozens of other specifications which we are called on to meet by buyers of flat wire who must have a product of exceptionally high quality.

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permits of such construction.

Presses are furnished in plain or fly-wheel drive or geared. Motor drives are available in flat or V-belt type or with the motor pinion geared directly to the flywheel. Each press is equipped with one plain bolster, one starting bar and all necessary wrenches.

The press is supplied in seven sizes, the rated capacities based on crankshaft diameters being 10, 14, 21.8, 31.5, 36.9, 56 and 78.7 tons. The standard stroke varies from 1½ to 4 in. and the maximum stroke with crankshaft varies from 3 to 7 in. The shut height, stroke

down, adjustment up, is from 5 in. on the seven types and the adjustment of the slide varies from 1 to 3 in. Strokes per minute are 200 r.p.m. on the 10-ton size to 90 on the 78.7-ton size. The weight of press for this size is approximately 1150, 1750, 2700, 3650, 7000 and 11,000 pounds.

Farrel Hydraulic Molding Press

The press shown in the accompanying illustration was built by Farrel-Inglish Company, Inc., Ansonia, Conn., for the molding of automotive head blocks. The press is of the self-contained, individually-powered type, the motor-driven pump mounted on the side of the press. Maximum capacity is 20 tons with one down-acting 21 in. diameter ram and two 6½ in. double-acting cylinders mounted in the top of the head and working under an initial pressure of 2600 lbs. per square inch.

The press has a maximum opening of 24 in. and a maximum stroke of 24 in. The platen area is 38x31 in. Both bottom and moving crossheads are provided with tee slots for the attachment of molds. Adjustment of the moving crosshead guides is made possible by

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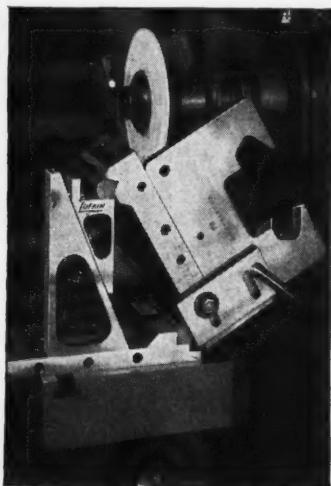
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A few of the many uses for this outstanding tool:

As an adjustable parallel because of the extra long face on the slide.

With a sine bar for grinding angles.
With gage blocks for building up work on a surface plate and for transferring measurements with an indicator.

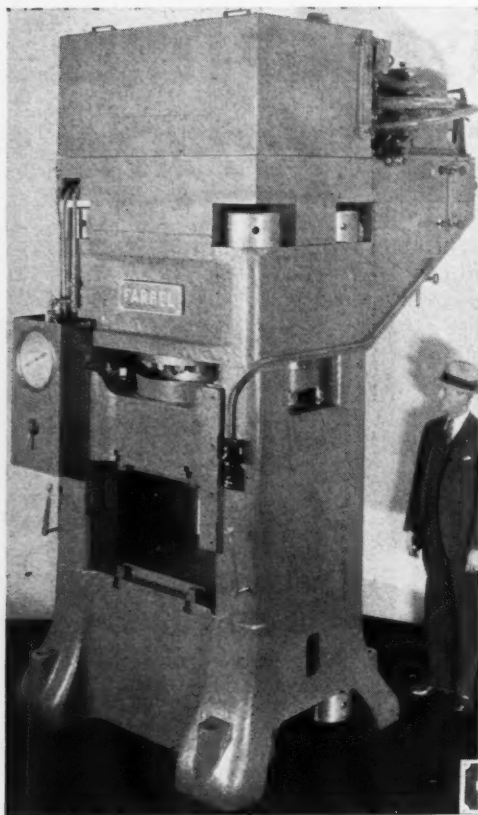
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THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

Canadian Factory
WINDSOR, ONT.

TAPES — RULES — PRECISION TOOLS



Farrel Hydraulic Molding Press

adjustable bronze gibs sliding against the finished interior surfaces of the press slide frames.

The power unit is a 23.8 gallon-per-

minute radial piston pump mounted, with the oil tank on the top cross-head. The control panel provides for pressure regulation over a range of from 10 to 500 tons. By means of a selective pressure system, this range of pressures has an infinite variation from minimum to maximum. Any ten pressures in this range may be set for immediate selection. On the "low" selection of pressures, the $6\frac{1}{8}$ in. diameter double-acting rams are used to develop a minimum pressure of 10 tons to a maximum of 100 tons. Above the 75-ton pressure pressures are developed both the $6\frac{1}{8}$ in. rams and the 21 in. main ram, and can be increased by small increments up to a maximum of 500 tons. The pressure of the selected pressure on the work may be automatically varied over a range of from 2 to 40 seconds by an automatic timing device.

A working cycle of the press is effected by push button control movement of which causes the moving cross-head to descend, engage the work at the predetermined pressure for the predetermined period of time, and upon completion of this "dwell" return to the top position.

Covel No. 15 Hand Feed Surface Grinder

Covel Manufacturing Co., Detroit Harbor, Mich., has brought to the attention of the machine shown in the illustration. The principal features of the new machine are the three-speed spindle, the enclosed motor and exceptional rigidity of construction.

The main frame of the machine is

NEW

Bond
SPEED REDUCERS

DOUBLE REDUCTION

"B" TYPE

SPEED REDUCERS

HIGHER RATIOS (4000:1)—HIGHER CAPACITIES

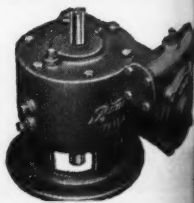
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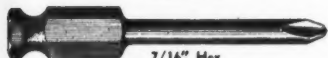
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Philadelphia, Pa.





Hand Brace



7/16" Hex



Nos. 130, 131 and 135 Yankees



Thor 0-191



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No. 31 Torsimeter



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SCREW DRIVERS AND BITS

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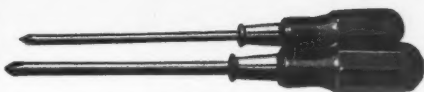
For Phillips Recessed Head Screws

APEX-PHILLIPS Bits for electric, air and spiral drivers are quality tools that will stand the hardest kind of service. They are made of a special shock resisting steel combining the qualities of extreme toughness, hardness and wear resistance. Special length Bits can be furnished promptly.

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APEX BITS are made of the same steel and heat treated to give the same qualities of toughness, hardness and wear resistance as APEX-PHILLIPS Bits.



APEX-PHILLIPS HAND DRIVERS

Hardwood Handles in natural or black finish—Blades that are so tough and strong that a Rockwell C 56-58 can be bent 90° without breaking. Because of the quality of steel and hardness, you can be sure of longer life. All four sizes are in stock.

Write for literature and prices and also Catalog No. 8 covering other Apex Production Tools.

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The use of high grade ball bearings at every rotating point practically eliminates the "wearing-out factor" from PROVIDENCE DRILLS, and assures "life-time" maintenance of speed, precision, and capacity. Measured by whatever standard you choose, the PROVIDENCE is the least expensive PRECISION DRILL to own and operate. It will save you time, tools, material and power.



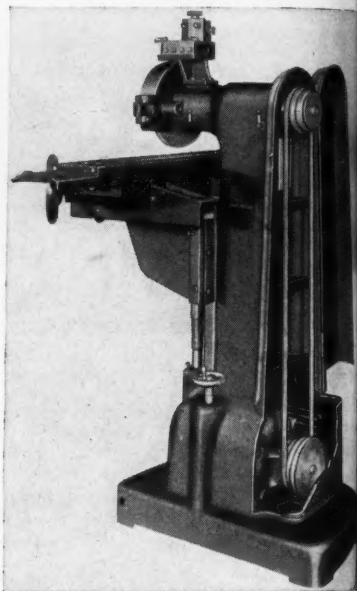
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Models, One to Six
Spindles, Hand or
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Every Model Full
Ball Bearing
Throughout.

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523 So. Main St., Providence, R. I.

in one piece with three heavy ribs the vertical section, insuring extra rigidity. The spindle, which is of a usually heavy design, is mounted in specially selected super precision, preloaded ball bearings. Power is transmitted by means of a three-speed V-belt drive from a motor mounted inside the base where it is protected from dust. The column door provides access for speed changing as required to suit the size of the grinding wheel. An outside hand wheel at the right of the column pro-



Covel No. 15 Hand Feed Surface Grinder

vides instant adjustment of the motor for belt take-up.

The box section knee is mounted on the main column by means of vertical dove-tailed ways with gibbs easily adjusted to compensate for wear. The knee is raised and lowered by means of a hand wheel graduated in 0.001 in. with an adjustable pointer.

The elevating screw is completely enclosed in a telescoping sleeve to prevent dust from collecting on the bronze nut and screw. An adjustable wheel truing device with diamond is mounted on the grinding wheel. For wet grinding a roller-mounted portable water pump and pump are supplied.

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Fast as Lightning

NO VALVE known to engineering science can be opened or closed with greater speed than the poppet type valve. No valve performs its function with less friction and wear on the working parts. Ross poppet type, air control valves reduce operating efforts to a minimum, giving instant, lightning-like action.

Valve seats of synthetic, oil-resistant rubber assure perfect seal—no leakage—long life. Seal not affected by frictional wear. All ports on one face offer important mounting advantages and simplifies installation. Short throw makes Ross valves ideally suited for mechanical control. Install Ross valves for the operation of your air actuated equipment.

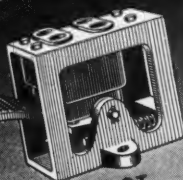
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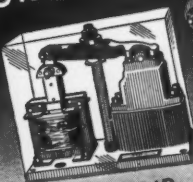
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A SIZE AND TYPE FOR
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The working surface of the table is 6x18 in. and the longitudinal travel of the table is 19½ in. Transverse travel is 7½ in., and vertical travel is 11 in. Capacity under a 10-in. grinding wheel, 10 in. Grinding wheel, 10x¾x2½ in. Spindle speeds, 1900, 2350 and 2900 r.p.m. Motor required, 1½ h.p., 1800 r.p.m. Height overall, 54 in. Floor space required, 50x63 in. Net weight, 1085 lbs.

Colonial "Universal" Broach Sharpener

A broach sharpening machine de-

Grinding Wheel Dressers

We make
all types
of
Dressers
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Cutters



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The Canadian Desmond-Stephen Mfg. Co., Ltd.
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signed to handle both flat and round broaches is announced by Colonial Broach Co., 147 Jos. Campau St., Detroit, Mich. The machine can be changed over from flat to round broach sharpening and vice versa with but a few minor adjustments and is equally well adapted to both classes of work.

Designated as the "Universal" Broach Sharpener, the machine is of exceptionally rugged construction throughout with heavily ribbed bed and table, designed for maximum simplicity of operation.

The sharpener is provided with a grinding head adjustable through an angle of 180 deg. horizontally, permitting complete reversal of the head. Vertically the head is adjustable from a horizontal position to 90 deg. below horizontal. The head is fitted with a hardened ground slide traveling on two hardened and ground roller chains riding on hardened and ground ways in the support. The rolls are held to 0.0001 in. for diameter and the entire slide mechanism is sealed against the entry of grinding dust. The head is also adjustable for side play, and is so designed that hydraulic feed for automatic operation may be incorporated if desired.

STRONG-ARM JOE SAYS:



I'M NOT TAKIN'
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Did you ever ruin a good fountain pen with poor ink? Well, if you've had that experience, you know just how I feel about die work.

When we build expensive dies, I'm taking no chances. I order MAC-IT socket-head cap screws and stripper bolts.

Then we sock 'em down tight and know darn well they'll stay put.

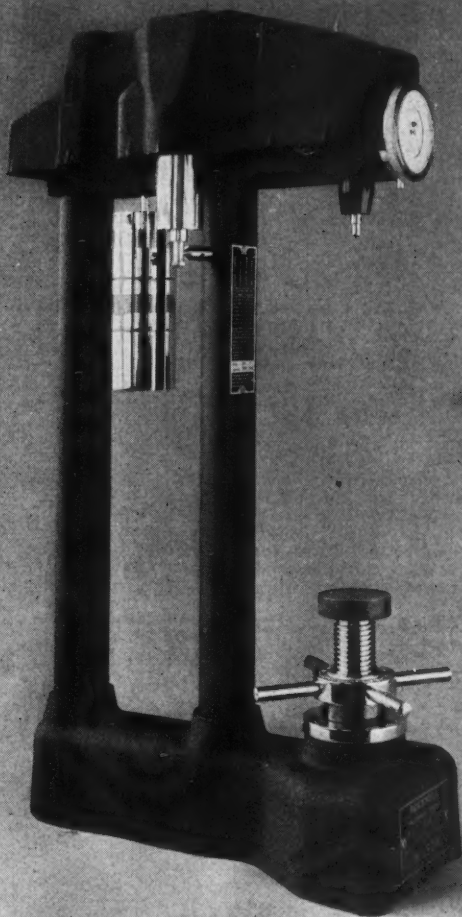
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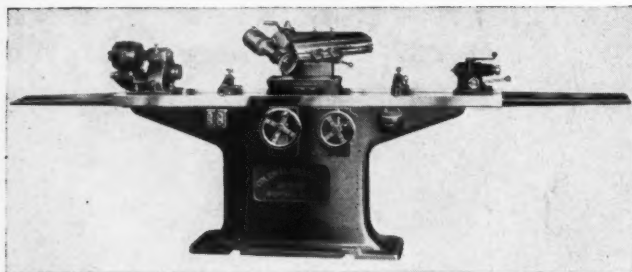


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MECHANICAL INSTRUMENT CO. INC.



Colonial "Universal" Broach Sharpener

Grinding wheels are 5-in. diameter with $\frac{1}{2}$ -in. face, for sharpening. For backing off, a 3-in. diameter wheel is furnished. Dust guards over the grinding wheel are provided as standard equipment.

The grinding wheel spindle is direct motor driven with a standard speed of 3600 r.p.m., the motor being $\frac{3}{4}$ h.p. The spindle is carried in adjustable preloaded, double-row bearings and is totally enclosed. Frequency changers permit operation of the grinding wheel spindle at speeds up to 10,800 r.p.m. Maximum travel of the slide is 10 in. Adjustable stops are supplied on the head and these are fitted with thumb

complete revolution of which is 0.025 in. Maximum range of adjustment is 10 inches.

The broach sharpener table has maximum travel of 60 in. Adjustment of the table is through a worm wheel. A vernier worm and y mechanism can be supplied to operate the main hand wheel, permitting adjustments to 0.0002 in. The table is carried on one V and one flat guide, the guides being lubricated by running in oil wells.

Equipment includes a headstock, stock and steady rests. The headstock is of the two-speed motor driven

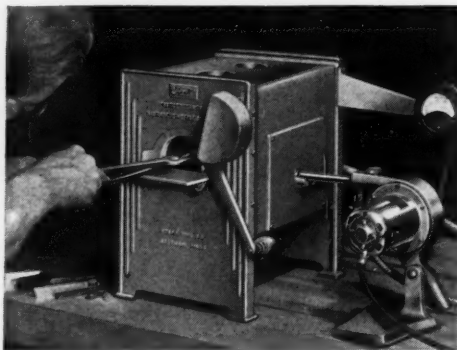
screws permit a vernier adjustment of the table. The permanent stops on the grinding head are spring loaded to cushion the head and wheel against shock at the end of travel.

Adjustment of the grinding column vertical is by means of a hand wheel.

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Operates at 7c per hour or less on natural, artificial or tank gas. Full muffle type. Attains 1800 degrees in 20 minutes.



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They are available in the "S" and "XLS" ball bearing series, the former starting at $\frac{1}{8}$ -in. bore and the latter at $1\frac{3}{8}$ -in. bore, the complete range running up to 21-in. bore and 28-in. O. D.; and there is the "RXLS" series extra light roller bearings, paralleling the "XLS" in size range.

Why not let our engineers tell you more about these Very Light Precision Bearings? Write for the Catalog.

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"NORMA-HOFFMANN"

PRECISION BALL, ROLLER AND THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORP'N.—STAMFORD, CONN., U. S. A.

fitted with a 1/3 h.p., 1200 r.p.m. motor. The tailstock is quick adjustable.

Magnetic chucks are supplied on special order, to operate on a 110 volt circuit. The machine will take flat broaches up to 10 in. in width if the broaches have straight teeth. For angled teeth the maximum width is slightly less. Floor space required, 16x4 feet.

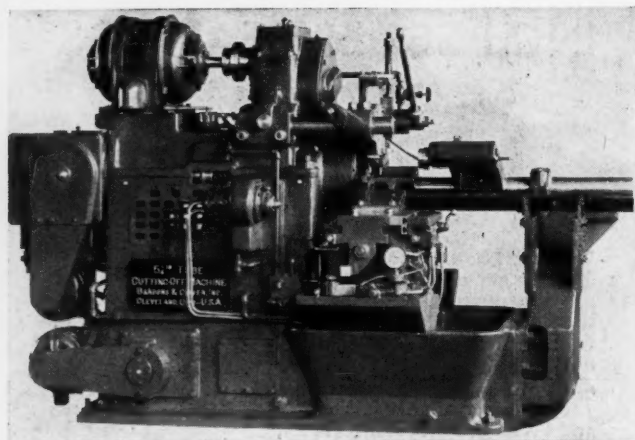
be divided equally, thereby reducing the cutting time to a minimum. Where pieces are not too long, multiple cuts can be taken and two or more pieces can often be cut off at one time.

Both slides, having rapid approach feed and rapid return, are hydraulically operated, two pumps being used for this purpose. The pump which feeds

the slides is geared directly to the spindle, and feeds are obtained in thousandths of an inch per spindle revolution. The feed is adjustable by turning a graduated dial located directly on the pump, and feeds in increments of ten thousandths of an inch can be obtained. A constant rapid traverse is maintained by the second pump, which is driven by a separate constant speed motor.

A hydraulic valve automatically controls the movements of the two slides by means of easily adjustable trip dogs when the machine is running automatically. The valve may also be operated manually if desired.

The spindle is made from a high carbon steel forging, and is mounted in tapered roller bearings. Two spindle speeds are obtainable by means of a lever conveniently located on the front of the machine, through a sliding gear which slides on a splined heat treating shaft mounted in tapered roller bearings. A wide range of spindle speeds is



Bardons & Oliver Cutting-Off Machine

Bardons & Oliver Cutting-Off Machine

Light and heavy wall tubing, pipe and bar stock can be cut off efficiently and at a rapid rate of production in a new automatic cutting off machine developed by Bardons & Oliver, Inc., Cleveland, Ohio. This machine will handle a maximum diameter of 5 3/4 inches.

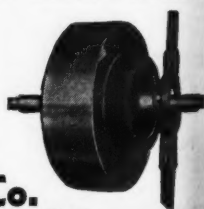
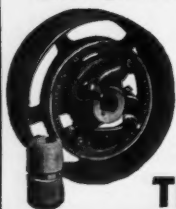
Two slides, one front and one rear, each carrying cutting off tools, operate simultaneously, permitting the chip to

"EDGEMONT" SERVICE TESTED FRICTION CLUTCHES

EXPANDING "TYPE B"

Especially adapted for Countershafts, Line-Shafts and many other moderate speed drives. Few working parts and rugged build account for its superior service.

Complete line of pulleys, countershafts, extended sleeve and cut-off couplings are listed in Circular B-4. Send for it.



The Edgemont Machine Co.

2100 HOME AVE.

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RYERSON *Certified* STEELS



**MEET DEFINITE SPECIFICATIONS
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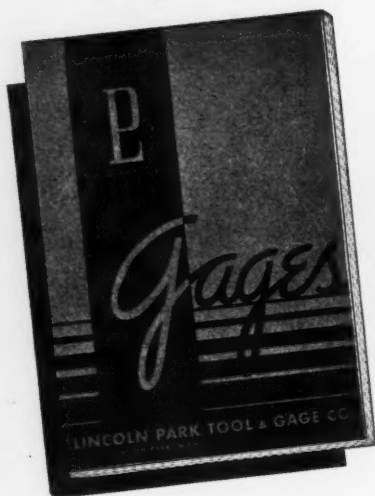
Ryerson Certified Steels are the result of many years of planning—developing new Specifications, new methods of control and complete readjustment of stocks. Definite specifications and rigid inspection systems now assure the qualities most desired in each class and type of material. Special handling and warehousing methods protect these quali-

ties and make possible immediate shipment of every requirement—large or small.

Let us give you the complete story of Ryerson Certified Steels. Write for Booklet LL. JOSEPH T. RYERSON & SON, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

If You Are A Gage User



You'll Find THIS HANDBOOK Invaluable!

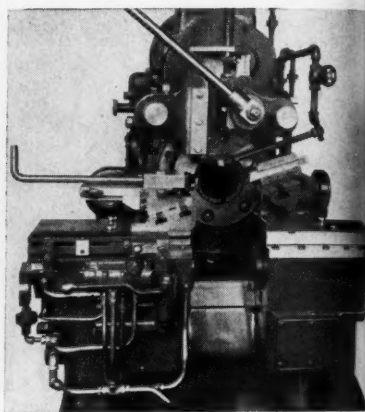
A convenient, pocket size handbook—packed full of informative and extremely useful data on gages and gage standards. It has been prepared for the practical man who requires essential facts in compact and easily accessible form. While the present supply lasts, requests for this handbook will be given immediate attention. Write for your copy NOW.

LINCOLN PARK TOOL and GAGE CO.

1719 Ferris Ave. • Lincoln Park, Mich.

obtained by means of change gears conveniently located and easily accessible. All gears and shafts are heat treated alloy steel. Anti-friction bearings are used throughout. All gears and anti-friction bearings run in a circulating bath of oil provided by a pump and cascade system of lubrication.

The master collet is of a hinge type and is air operated. Provision is made to automatically compensate for slight variations in stock size. There is



End View of Bardons & Oliver Cutting Machine

limit to the length of stock that can be fed out by the patented roller bar feed. It is only necessary to provide a stop bar of the proper length to suit the work. The roller bar feed is driven by a separate constant speed motor thereby maintaining a constant feed rate regardless of spindle speed. The feed may be reversed electrically when it is necessary to back the stock out of the spindle. A disconnecting feature is built into the roller bar feed by means of which the rollers can be spread apart when the collet is open.

The stock stop is air-operated and is mounted on a rigid bar which is anchored securely in the head casting. A fine adjustment of the stop along the bar is obtained through a rack and pinion.

A coolant pump with built-in motor is mounted in a convenient position on the outside of the machine. The constant speed main drive motor is mounted on top of the head, and is



TUF-FLEX

This new hack saw blade has already proved a sensation. It's an entirely new type—super-tough, super-flexible, extra hard—a general purpose blade that stands a remarkable amount of abuse without stripping on thinnest sheet or tubing. Its performance on large sections, drill rod, tool steels, etc., is amazing. TUF-FLEX cuts smoothly, efficiently, is practically unbreakable.

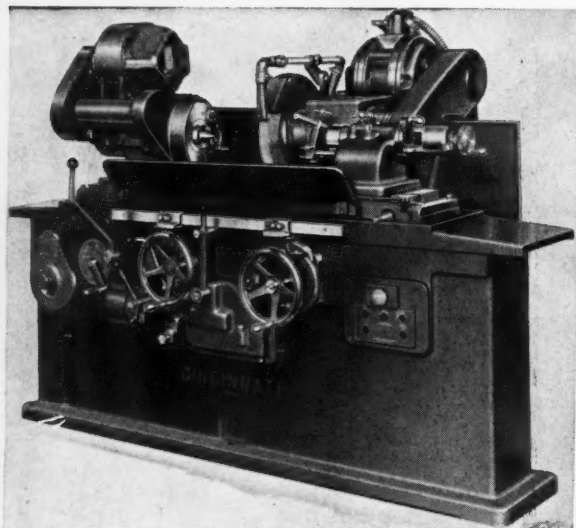
We challenge you to try TUF-FLEX blades on any jobs where ordinary tungsten blades are now used. We promise unusual performance and the lowest blade cost you've ever experienced on general purpose work. Write for further particulars and name of nearest TUF-FLEX distributor.

MILLERS FALLS COMPANY

Greenfield, Mass.

rectly connected to the drive shaft by means of a flexible coupling. Electrical controls are centralized and within easy reach of the operator.

For solid bars, an accelerating feature is available, by means of which the spindle speed increases as the diameter of the bar is reduced, thereby maintaining a uniform surface speed.



Cincinnati Universal Grinding Machine

Cincinnati Universal Grinding Machine

Intended primarily to serve as tool room equipment, and therefore designed to produce the best grade of finish and a high degree of accuracy, a new Universal Grinding Machine has been brought out

by Cincinnati Grinders, Inc., Cincinnati, Ohio. Flexibility, ease of operation, and sufficient weight to maintain alignment are features of the machine, and it is available in 12 and 16-in. sizes; and 36, 48 and 72-in. between-center lengths.

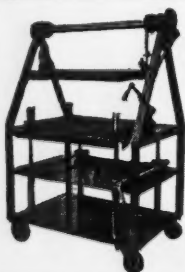
The spindle bearing design with its companion lubricating system is similar to that in the Cincinnati Roll and Plate

Self-Contained Grinders. A small motor mounted on the wheel head unit draws oil from a built-in reservoir and pumps it first through a renewable filter and then to the bearings, completely filling the space around them. As soon as the pressure builds up to about 4 lbs., a pressure switch starts the main drive motor. If the lubricating system should fail to function for any reason whatever, the pressure will drop and the pressure switch will immediately stop the main drive motor.

The bearings themselves are the multiple shoe type, definitely protected against oil leaking out or dirt getting in. The bearings are self-compensating for changes in load. A motor mounted on the wheel head unit drives the grinding wheel spindle through

the medium of multiple V-belts which are protected by a guard.

The headstock unit has no gear contacts or worm drives, power being transmitted from the motor to the face plate through the medium of V-belts and silent chain. A $\frac{3}{4}$ h.p. variable speed motor, mounted on a vibration-absorb-



JOHNSON Multiduty DIE TRUCK

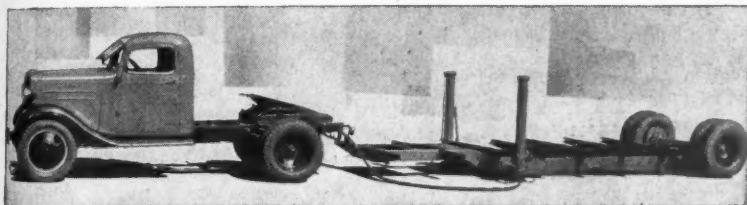
TRUCK—HOIST—PORTABLE WORK BENCH—ALL IN ONE

A practical die truck that makes the handling of heavy die sets (up to 5000 lbs.) a one man job. Overhead feature fully described in our circular. Write for further information.

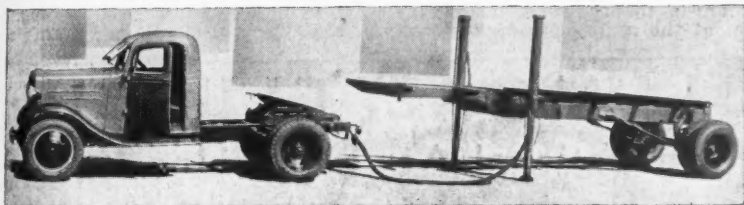
O. JOHNSON CO. 9020 Brookfield Ave., Brookfield, Ill.

POWER TAKE-OFF - a use of flexible shafting that has many possibilities

Flexible Shafting provides a simple, convenient means for driving from any source of power. Combined with a flexible casing, it can be readily arranged for quick connection to driving and driven members. Here is a typical example.



Flexible Shafting take-off from rear of draft vehicle drives a hydraulic pump on trailer chassis of this Cederstrom (patented) Freight Handling Unit.



Hydraulic pump pistons raise and support the chassis preparatory to coupling to the draft vehicle.

The large range of sizes and the wide diversity of physical characteristics in which S.S.WHITE Drive Shafting is available, makes it possible to meet practically any power take-off requirements.

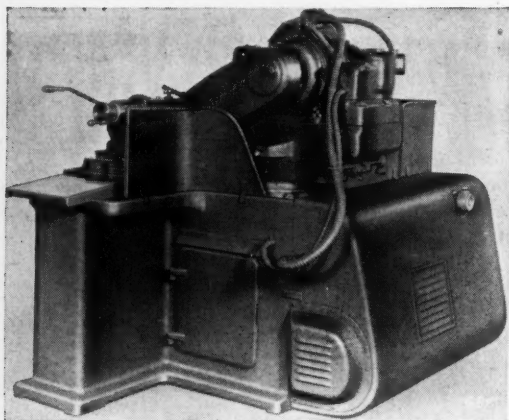
We will be glad to cooperate in selecting the proper shaft for a particular drive and in working out the details of application. No obligation. Just send us essential data.

S. S. WHITE

The S. S. White Dental Mfg. Co.

INDUSTRIAL DIVISION

10 East 40th St., Room 2310S, New York, N. Y.



Rear View of Cincinnati Universal Grinding Machine

ing shelf-type bracket, drives the unit. The unit may be swiveled through an angle of 150 deg. for face and angle grinding, and an infinite number of work speeds, ranging from 60 to 240 r.p.m., are available by adjusting the rheostat at the operator's working posi-

tion in front of the bed.

Built-in electrical controls are a prominent feature. Behind the hinged cover on the right-hand end of the machine is a compact group of magnetic starters, accessible and out of the way, effectively protected against dirt.

Control buttons are built into compact units, set back and flush with the front of the bed. The group at the right includes start and stop buttons for the grinding wheel (also starts the table feed box), an off-on button for the coolant pump, start and stop buttons for the internal attachment (also starts the table feed box), and a large red button which stops everything. The group at the left includes a three-position button for the headstock motor and coolant

pump, and a rheostat for changing work speeds.

Mechanical operating controls are grouped in front of the bed, accessible from the operator's working position.

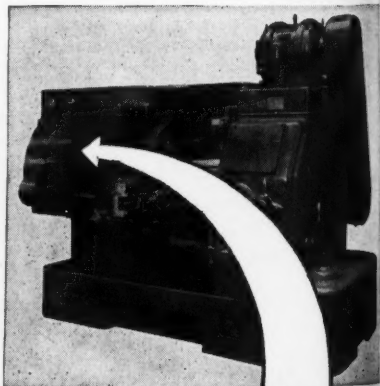
The bed is a one-piece casting, substantially ribbed to maintain align-

PULLMORE CLUTCHES

Used in National Acme Chucking Machines

Each of the 6 spindles of the National Acme Chucking Machine shown at right uses a No. 16 double type Pullmore Clutch operating dry. The clutches engage and disengage automatically as the spindles index. One side of each clutch acts as a brake to stop its spindle quickly after the machining operation is completed. This service requires a clutch that provides quick, smooth engagement, efficient power transmission and greatest dependability; characteristics which are synonymous with the name Pullmore.

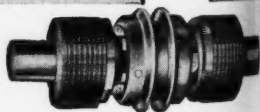
Pullmore Clutches meet the design and service requirements of automatic and semi-automatic machinery; are made in single and double types, for operation in oil or dry, in many sizes for transmitting up to 75 h.p. Complete information about Pullmore Clutches, illustrations of many of their applications, and useful data will be found in the Pullmore Blue Book. Write for free copy, today.

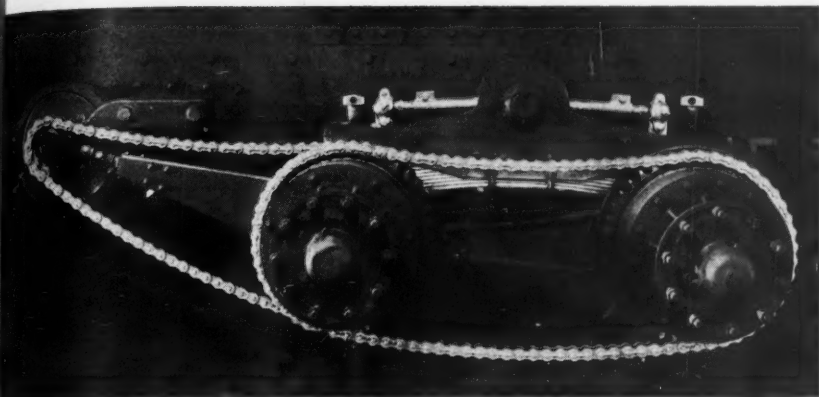


ROCKFORD DRILLING MACHINE DIVISION

Borg-Warner Corporation, 300 Catherine Street, Rockford, Illinois

Sold by MORSE CHAIN CO., Ithaca, N. Y. Offices in principal cities





(Photo courtesy the Fager Co., Huntington Park, Calif.)

PROOF

that Roller Chain can "take it" best

Heavy duty truck drives like this employ Baldwin-Duckworth Roller Chain because it alone can stand the strains and overloading incident to sudden starts and stops. The surplus power that makes Baldwin-Duckworth Roller Chain the choice for this Fager four wheel truck drive is an asset worth serious consideration whenever a positive, low-cost, long-life power drive is needed in the plant. Baldwin-Duckworth Chain Corporation, Springfield, Mass. Factories at Springfield and Worcester, Mass.

**Call the
B-D MAN**

BALDWIN



DUCKWORTH

ments. The wheel head unit provides accurate adjustments of the wheel to the work through square gibbed slides and narrow guides which are well protected from water and grit. This unit may be swiveled through an angle of 90 deg. either side of center.

Twelve traverse rates are available, ranging from 4 to 63 in. per minute. A multiple disk clutch on the shaft of the driving pinion eliminates the shock of reversal. Perfect alignment between the headstock and footstock units is obtained by means of a truncated locating "V" machined in the top of the

table. Swivel adjustment of the table ranges from 10 deg. forward to 2 deg. back.

Built into the table reversing unit is a hand pump lubricating system for oiling the moving parts within this unit and the bed. Work diameter reduction may be adjusted to an incremental low as 0.00025 in. through the automatic feed mechanism.

The coolant pump is a $\frac{1}{8}$ h.p. motor driven unit, capable of delivering 15 g.p.m. per minute.

The Cincinnati Universal Grinder is arranged for either a fixed or swing frame internal grinding attachment. The fixed attachment, driven from a pulley mounted on the main motor shaft, is supplied as standard equipment.

National Metal-Shaving Machine

The Shaving Machine illustrated herewith has been designed by the National Broach and Machine Company, Shoemaker at St. Jean, Detroit, Mich., for the accurate finishing of one or more bearing or locating surfaces in order to provide the necessary accuracy for subsequent operations, especially gear tooth cutting. The machine is 16 ft. high, fully automatic and rotates continuously. This unit turns out products

ALL ALLOY PORTABLE SHEARS

FULLY
GUARANTEED



Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to $\frac{1}{4}$ " steel plate.
Special Blades for shearing stainless steel.

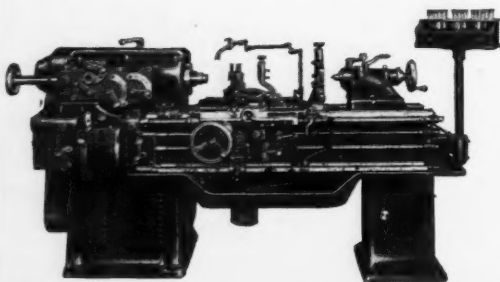
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SIDNEY

PRECISION TOOL ROOM LATHES



● New features include Quick-Change Gear Box—a separate, enclosed unit, tongued, grooved and bolted to the front of the bed. All shafts in gear box and on quadrant operating on anti-friction bearings. 48 complete thread and feed changes without the use of extra gears.

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THE SIDNEY MACHINE TOOL CO.

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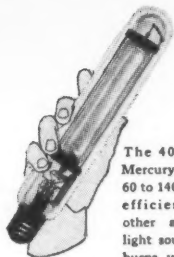


PICTURE OF MODERN LIGHTING *for profits*

in this shop is proof that higher production makes it easier for workers without effort. Production is high, and errors are at a minimum because eye-strain and its resultant accidents are greatly reduced. Modern lighting is recognized in modern industry as an extremely valuable production "tool." It directly improves the efficiency of every worker and every machine. Bear in mind, too, that no other comparable light source gives as

much light per watt as these modern light sources.

Investigate General Electric Type-H Mercury Lamps if you are interested in the profits that better light can assure. They are adapted for use on either 115- or 230-volt lines. They may be combined with incandescent lamps to produce a light which simulates and blends well with daylight. Write for complete information.



The 400-Watt Mercury Lamp is 60 to 140% more efficient than other available light sources. It burns vertically only.



By combining Mercury and Incandescent Lamps in many conventional type luminaires, a psychologically cool, white light can be obtained.

GENERAL ELECTRIC

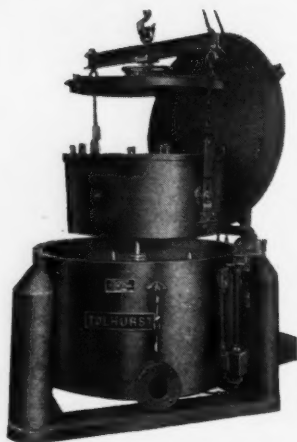
General Electric Vapor Lamp Co.
Adams Street, Hoboken, N. J.

Incandescent Lamp Department
Dept. 165, Neis Park, Cleveland, Ohio

Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Company.

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RETURN THEIR COST MANY TIMES YEARLY

Tolhurst "Chip Wringers" reclaim up to 97% of cutting oil on crushed chips, save tool wear, reduce labor costs — provide one of the most profitable investments a machine shop can make.

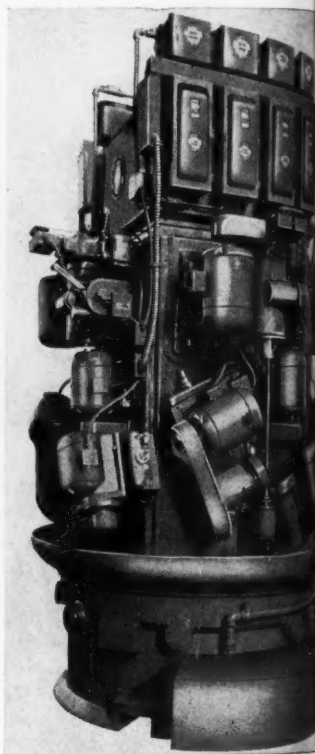
The folder "Tolhurst Chip Wringers", describing the savings these machines are bringing to their owners, will be sent you on request.

TOLHURST Centrifugal Division

American Machine and Metals, Inc.
100 Sixth Avenue
New York N. Y.

the rate of one unit every seconds with a limit of 0.001 in. dimensions and 0.001 in. on all

The table, or base, is stationary rectangular column above this rotates about a vertical axis at a one revolution every 28 seconds. panel of this rectangular column accommodates one work unit. Theously. This unit turns out prod



National Metal-Shaving Machine

incipal operating elements are located the outside surface of the machine where they are easily accessible for adjustment and maintenance.

Each column panel carries spindles, one to rotate the work and two for the shaving cutters. The first cutter shaves a cylindrical hub and the second shaves a flat bearing. The cutters operating simultaneously the work unit rotates.

The cutters are circular and rotate with a tooth form similar to that

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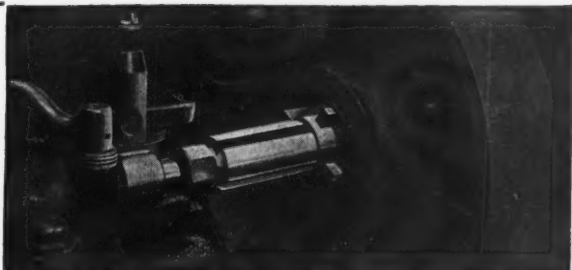
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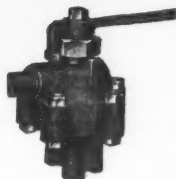
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have available for immediate use internal lathes for holding any break-down job comes along. Can be used on lathes, grinders, reamers or millers. Take bore— $\frac{1}{2}$ " to 7". Made in fourteen sizes. Bulletin 530.

3 and 4-Way CONTROL VALVES for operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressures up to 3000 lbs. Bulletins on request.



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Cedar Rapids Eng. Co.
Cedar Rapids, Iowa

broach. The cutters are moved into position by cam action against the rotating work unit, thus no sudden load is thrown on the tool. Eighteen standard motors are included in the assembly of this machine. Plugging relays prevent coasting when the automatic control mechanism turns off the current. The entire electrical system operates on 110-volt current for safety and convenience.

Each column panel carries its own forced feed lubrication system. Coolant is under automatic control, flowing only while cutting is actually in progress. All slides are hardened and ground and spindles are easily adjustable for various stages of wear and cutter size. V-belt drives and anti-friction bearings are used throughout the machine.

The operator places the work piece between centers and locks it in place with a handle. Cutting begins immediately after loading and continues as the main column rotates. As each panel returns again to the loading position, its motors are automatically stopped and its work unit released for removal. During the cutting operation, the part and cutter are rotated at very high speeds.

In the operation under discussion, the cutter simultaneously removes 0.010 to 0.015 in. from the flat surface and

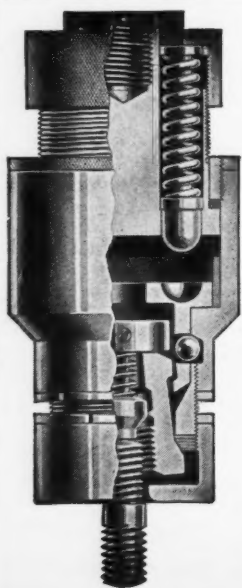
0.020 to .030 in. from the bearing surface. Cutters are of Steel, approximately 7 in. in diameter with teeth having approximately 12° angle.

Each panel operates as an independent machine, and the starting of panels depends entirely on the operation of the clamping handle. If the handle fails to load one panel, this panel will not operate. This eliminates unnecessary wear while the machine is in operation. The machine shaves either cylindrical or flat surfaces on the same machine as that used for the shaving of tooth surfaces, which has so far been the gear cutting work of the last few years.

Whitney-Jensen Rolling Machine

Sheet metal fabricating shops need air conditioning and ventilating and other similar forms using sheet metal. Seams may now save a considerable amount of the expense of forming these by using the new No. 75 Duplex Rolling Machine recently introduced by Whitney Metal Tool Co., 91 Park Street, Rockford, Ill.

The most interesting feature of this new machine is that it has a drive of rolls, thus permitting one set



TITAN STUD SETTER CONTROLLED DRIVE Assured Perfect Setting

The Titan Stud Setter has a safety clutch which controls driving power.

The Titan is positive in driving and automatic releasing, thus making it possible to set the studs to any predetermined degree of tightness.

When the studs are driven to the specified tightness the drive is automatically released and the tool can be removed without fear of mutilating or distorting the threads.

The great capacity, speed range, utility, and accuracy of this production tool make the Titan Stud Setter a profit-earning tool wherever it is used.

Write today for the new illustrated circular.

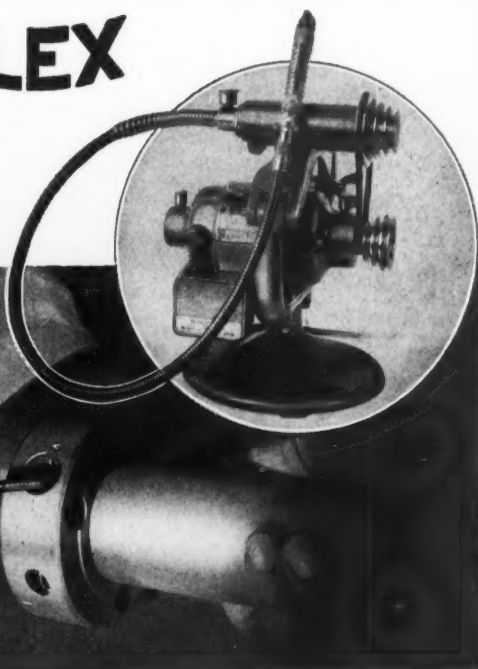
TITAN TOOL COMPANY

FAIRVIEW

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KELLERFLEX

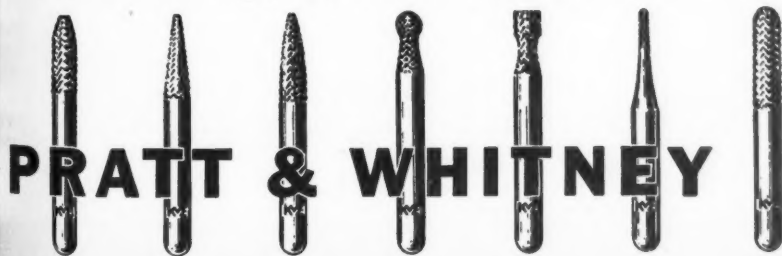
—Chamfering an elliptical hole better job and a 50% saving over filing. The Kellerflex JB-0 Machine (shown at right) is ideal for this. speeds from 900 to 9000 R.P.M.

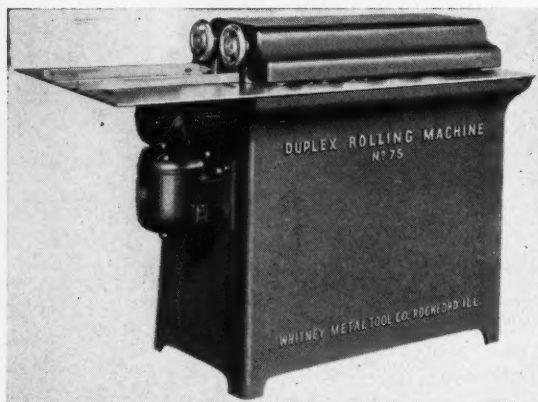


Use power filing for these jobs

Power filing is rapidly replacing hand filing in metal working shops. Modern practice calls for burs and rotary files in connection with flexible shaft machines, portable drills or stationary machines. Other operations include power filing of bronze, brass and aluminum castings, dies,

molds and patterns. This is the ideal method for finishing "hard-to-get-at" places. For full information on flexible shaft machines, and for bur shapes and sizes, write to the Kellerflex Sales Department, Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford, Conn.





Whitney-Jensen Rolling Machine

used for forming corner locks and the other for drive cleats, or some similar folded form. Either or both sets of rolls may be used at any time, so that no changeover of the machine is required when switching from one type of work to the other. Various sets of rolls will be furnished as the user requires.

The machine will handle material up to 18-in. thickness, and feeds sheet through the rolls at the high speed of 88 ft. min. Rigid, accurate construction and a 1 h.p. motor make this possible.

The rolls are adjusted to the thickness of the material being formed by means of a handwheel with a graduated scale for accurate setting. The handwheel controls all of the rolls simultaneously by means of a special bar cam. The rolls are carried on 1½-in. spindle mounted in two heavy roller-type roller bearings, which are driven through bevel gears at the center of the spindle between the bearings.

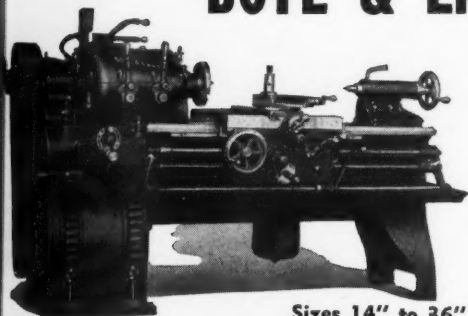
The extension feed table has adjustable guide bars which can be set to control the amount of overhang as desired when running corner locks. Working parts and the base are covered with a sheet metal case which gives wide-radius corners giving a smooth neat appearance and enhancing

T-J CUTTERS
Standard styles and sizes for your ordinary jobs. Send for Catalog 134-A.
Special to your order for your out of the ordinary jobs. Offices in Detroit and Chicago. Represented in Eastern Territories by Industrial Steel Inc., Cambridge, Mass., and I. A. Renselmeier, Wilkensburg, Pa.



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CINCINNATI OHIO

frequent complete re-designing enables our engineers to incorporate into BOYE & EMMES Lathes every worthy new improvement and many original and exclusive developments in lathe construction. BOYE & EMMES Lathes are modern in every respect.

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They are modern, economical, speedy units which hold six to eight times more effectively than corresponding taper pins. Furthermore, they replace the old time-consuming bolts, keys, cotter pins, etc. GROOV-PINS require force nearly their entire length before they can be withdrawn.



Use GROOV-PINS . . . the resulting economies manifest themselves in reduced steps of assembly routines — in reaching hitherto inaccessible places, the grooving principal can be advantageously employed as a dependable fastening medium in thousands of products with greater economy and greater safety.



More than a billion GROOV-PIN products are now used by leading manufacturers.



Complete information and engineering data in the GROOV-PIN bulletin—write for it.



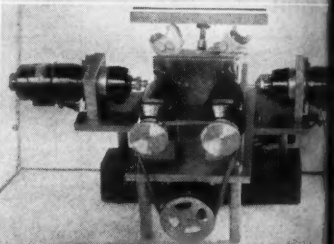
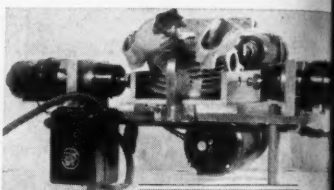
GROOV-PIN CORP.

411-13 KERRIGAN AVENUE
UNION CITY • N. J.

cleanliness of the machine. The is of welded angle and plate construction, amply reinforced for rigidity. Two of the feet have adjustable leveling screws for setting the machine on an irregular floor.

Govro-Nelson Automatic Drilling Unit

Designed for drilling operations $1/32$ to $3/8$ in., an automatic unit manufactured by Govro-Nelson Company of Detroit, is offered by

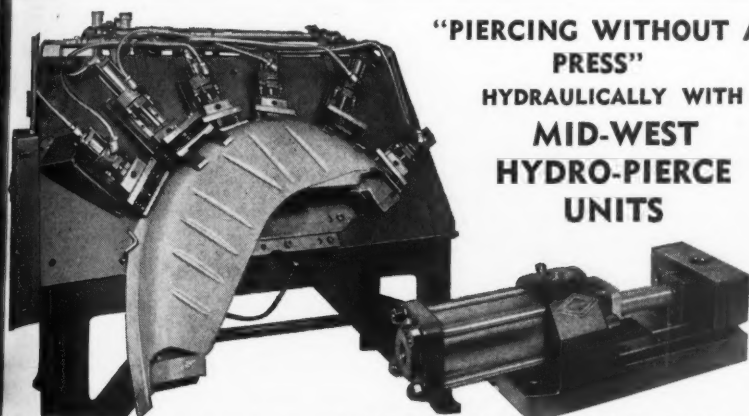


Four-Way Fixture with Govro-Nelson Drilling Units

Engineering Service, 1935 Anzures Street, Detroit, Michigan.

The unit is mounted on the shaft of a standard motor and operates at motor speeds for driving the drill. Pressure results from centrifugal force expanding a set of segmental weights sliding in a spacing disc between cone members, one of which is stationary while the other slides on the shaft of the unit.

A garter spring holds dogs on sliding cone in engagement with a key through the inner spindle. As weights expand, due to centrifugal force, the cones are separated, moving the inner spindle forward so as to feed the drill to the work. Installation of 3, 4, 5 or 6 weights made of steel, Dural or cast iron provides a wide range of pressures to permit loading the drill to the most desirable limit with



"PIERCING WITHOUT A PRESS"

HYDRAULICALLY WITH
MID-WEST
HYDRO-PIERCE
UNITS

Note how simple it is to adapt Mid-West Units to a Wheel House panel. Easy to load, faster operation, safer to operate and low building costs.

MID-WEST PRODUCTION ENGINEERING, INC.

221 E. MILWAUKEE

DETROIT, MICH.

NEW

U. S. No. 1 Anti-Friction Bearing Hand Milling Machine

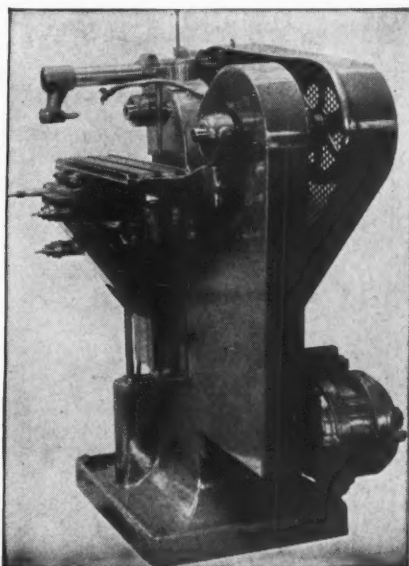
The New U. S. Hand Miller is particularly adapted to high speed light milling operations. Vertical and horizontal feeds.

Improvements: Heat treated chrome nickel steel spindle, Timken bearings, Ballbearing countershaft, V-belt drives, 6 Spindle Speeds up to 1592 R.P.M., providing efficient use of small end mills.

Write for full details.

**The UNITED STATES
MACHINE TOOL Co.**

1954 W. 6th St. Cincinnati, Ohio



assurance that it will not be overloaded either because of hard material or dull tools.

Upon starting the motor, the tool advances quickly to the work. It will drill through one wall, jump an air gap and drill until an adjustable stop expands the dogs on the sliding cone and releases the tool carrying inner spindle, which is then returned to the starting point by its return spring. Disconnecting the motor current permits the shaft speed to reduce to a point where the resetting spring, which has been compressed by the sliding cone, will return the cone to its starting position, forcing the weights toward the center and engaging the feed dogs with the inner spindle, ready for the next cycle.

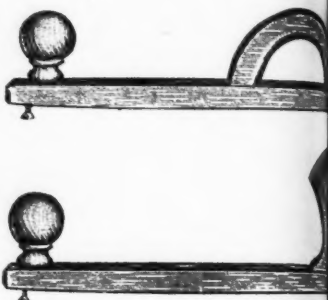
The unit is especially adaptable to multiple installations, in one or more planes and angles, and in connection with other operations such as milling, boring and heavy drilling.

Hy-Tool Flexible File Holder

Where any amount of filing is to be done, such as draw filing keys or filing automobile bodies and fenders for finishing, the strain of holding and operating the file is considerably reduced by

the use of a file holder which is placed on the market by W. G. 13 Penfield St., Buffalo, N. Y.

The holder is made in two styles.

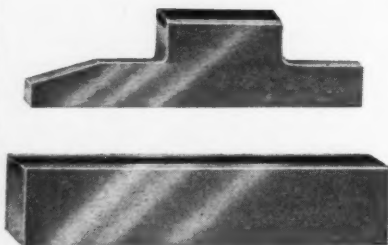


Hy-Tool Flexible File Holder: Style No. 1 (above) and Style No. 2 (below)

for use with 14-in. flexible file. It is made of well seasoned wood facilities for holding the file on the underside of the holder and with a grip on the top so that the file can be grasped with one hand while the grip is held with the other. The

TUNGSTEN CARBIDE GRINDER REST

One-Piece Inserts 30" In Length and Longer and Brazed to Centerless Grinder Rest Blades



A TOUGH Tungsten Carbide All Metal of proven superiority and LOWER COST. Extremely dense surface of Rockwell A hardness of 88 to 90 prevents marking or scoring of the work. Tungsten Carbide blades reduce grinding time, grinding expense, replacement costs, and maintain greater accuracy. Life is increased 30 to 50 times over cast-iron or steel blades.

SEND SKETCH OF BLADE FOR QUOTATION

Manufactured by

METAL CARBIDES CORP. • YOUNGSTOWN, OHIO

"NEW D & W" MAGNETIC CHUCKS

Styles 7x17 and 6x13



Developed to meet demand for chucks lower than our standard style.

Send for folder covering
Chucks and Demagnetizers.

D. & H. ELECTRIC CO.
2 Richmond St., Providence, R. I.

USERS OF BALL BEARINGS !
Selective assembly made faster,
more accurate.

COMTORPLUG

Shows half ten-thou-
sandth variations at a
glance.



Comtorplug expanding plug gage, by a unique principle, eliminates the element of human variation. Positive readings to half-tenth improve the accuracy of inspection, greatly increase the speed.

Request Bulletin 25.

THE COMTOR CO.
Waltham, Mass. Est. 1928

Experienced Machinists
Appreciate This

NEW DEVELOPMENT

EVANS REAMERS
SURPASS ALL.
HIGH SPEED STEEL.

No Honing.
Chrome Like Finish.

50 to 80 thousandths expansion.

Full Bearing Surface.

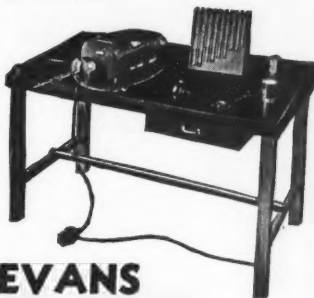
Perfect Alignment.

Will not chatter.

With Left and Right Spirals.

It can not fall in slots or oil
grooves. Extension Pilots for
Line-up Work.

3-SPEED REAMER DRIVE



EVANS REAMING SHOP

WRITE FOR CIRCULAR

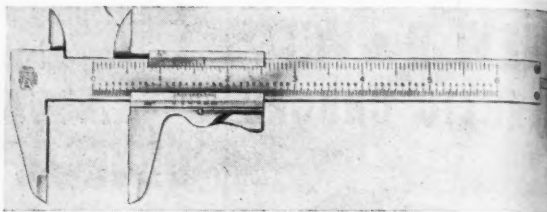
EVANS
FLEXIBLE REAMER CORP.
3656 Lincoln Ave., Chicago, Ill.



made in two styles, as shown in the illustration.

Mausser Stainless Steel Vernier Calipers

The Mauser Universal Vernier Caliper shown in the illustration is now being marketed by George Scherr Company, 130 Lafayette St., New York, N. Y. This type of tool was formerly available only in chrome steel, which tended to tarnish quickly in damp atmosphere or where acid was being used in the vicinity. The caliper shown is made of stainless steel which has been especially selected for the purpose and which can be hardened to a high degree. The measuring surfaces of this caliper have a Rockwell hardness of not less than 55. The tool can be used in ordinary, everyday work under practically all conditions.



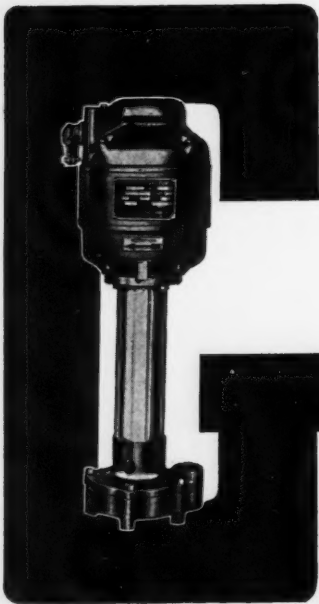
Mausser Stainless Steel Vernier Calipers

the former standards for half capacity drills, without sacrifice strength or power, is the primary engineering accomplishment in the half-inch electric drill just announced by the Independent Pneumatic Company, 600 West Jackson Boulevard, Chicago. The new drill, known as Thor U44, is a heavy-duty tool, designed for continuous service on production the same time, its light weight and small size give it the portability carrying ease necessary for maintenance work.

Because of its streamline design, Thor U44 can be used in places formerly inaccessible for one half inch drills and great pressure can be applied

Thor 1/2-In. Portable Electric Drill

Reduction of weight and size to half



No Packing - No Priming No Metal-to-Metal Contact

NO PACKING—Gusher Coolant Pumps have no packing to leak, consume power or require adjustment.

NO PRIMING—Priming is automatic and instantaneous. Coolant flows in one-fifth of a second.

NO METAL-TO-METAL CONTACTS—This insures continuous and dependable handling of tapping, grinding compounds, etc.

There's a Gusher Coolant Pump for every cutting. Write for further information.

The Ruthman Machinery Co.
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No. 35T
HARPENE
AUTOMA
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up to 5 1/2"
100 SAWS
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166 FULT

**Standardized
JIG BUSHINGS**
Acme Standard
over 6700 Items
A.S.A. Standard
over 4200 Items

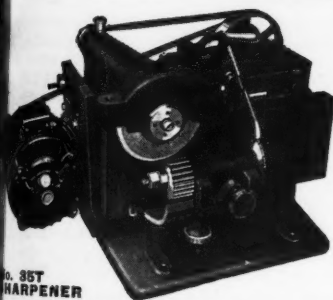


Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.

**ACME
INDUSTRIAL
COMPANY**

212 N. Laflin St.,
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No. 35T
SHARPENER

**AUTOMATICALLY SHARPENS
METAL SAWS IN GANGS**

Up to 5 1/2" diameter and up to 1 3/4" thickness.
100 SAWS OF 26 GAUGE CAN BE SHARP-
ENED AT ONE TIME.

Our saws are automatically indexed and sharp-
ened within a variation of plus or minus .001
exact diameter of entire lot.

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THE WARDWELL MFG. CO.

166 FULTON RD.

CLEVELAND, O

Flexoid
INDUSTRIAL COUPLINGS

are

QUIET!



Carefully check these advantages of Flexoid couplings—then decide if it wouldn't pay you to investigate them for your job.

- No back lash.
- Never become noisy.
- Require no lubrication.
- Operate horizontally or vertically.
- Absorb all vibration, shocks and jolts.
- Impervious to oil, sand, water, etc.
- Can be used on reversing drives.

Write for further facts and quotations now.
Prompt shipments from stock.

Flexoid Coupling Co.

*Division of The Smith Power
Transmission Co.*

410 Lakeside Ave., N. W.
Cleveland, O.

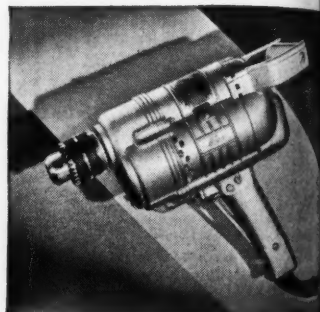
out danger of throwing the armature out of alignment.

The U44 can be furnished with 110 or 220 AC or DC Universal motor which operates from any electric light socket. Free speed is 450 r.p.m. and full load speed 300 r.p.m. Spindle offset is $1\frac{1}{4}$ in. Weight is 9 lbs.; length, 12 in. over-all.

Standard equipment includes $\frac{1}{2}$ in. Jacobs Chuck, spade handle, lever-type side switch handle that can be locked for continuous operation of the drill, and 10 ft. of three conductor molded rubber cable with ground wire. The U44 can be furnished with keyless chuck,

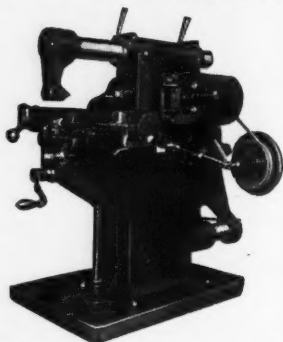
No. 1 or No. 2 extension Morse shank if desired.

Every moving part of the U44 rests on one of eight precision ball-bearing. Spindle and lower armature bearings are seal-tight so grease cannot enter.



Thor $\frac{1}{2}$ -In. Portable Electric Drill

BURKE Milling Machines



Burke motor driven milling machines, Nos. 1, 2, 3 and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

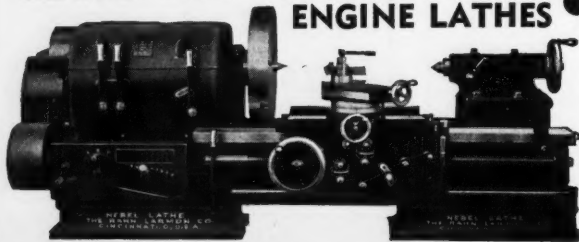
BURKE MACHINE TOOL CO.
297 E. 16th St. Conneaut, Ohio

field case from gear case or be taken out around spindle. Upper armature bearing is sealed in grease. Field handles, center plate and gear case are die cast from high-grade aluminum alloy. Gears and shafts are made of hardened and ground alloy steel.

The switch, which is completely closed in the safety lever handle, is of two pole construction and the switch is wrapped in fibre sheet for double protection against ground faults. The trigger for the switch is conveniently located and is provided with a lock so that it can be used either as a safety switch or as an off-on switch.

The armature in the U44 is large in proportion to the tool size and is made from hand formed coils which are separately wound with triple insulation.

GEARED HEAD & CONE DRIVEN ENGINE LATHES



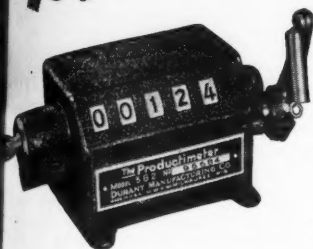
Sizes
16" to 36"
Swing

A full line of Gap Lathes
18" to 50" swing

Write for complete
information.

THE
RAHN-LARSEN
COMPANY
CINCINNATI, OHIO

Are Your Machines Running Blind?



A punch press or any production machine running without a counter is as good as blindfolded. The counter dials are the eyes of the machine, telling the operator every second just where he is. *Productimeters* save losses from over runs, under runs and time wasted in hand counting.

DURANT MFG. CO.

1932 N. Buffum St.,
Milwaukee, Wis.

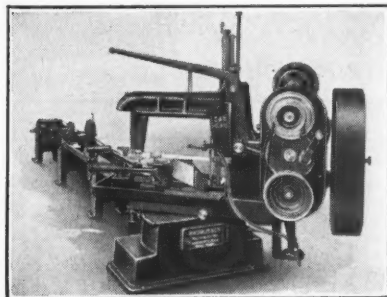
173 Eddy Street,
Providence, R. I.

THE NEWEST DEVELOPMENT IN METAL CUTTING MACHINES

FULL AUTOMATIC — CAPACITY 10"x10" & 6"x6"

Stops when desired number of pieces have been cut. Length of cut is gauged by scale without end stop. Swivels on base for angular cutting.

Also built for manual operation.

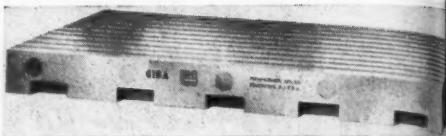


RASMUSSEN MACHINE CO.

RACINE, WIS.

Send for circulars giving
complete information.

Commutators are mounted on a brass sleeve and locked with a threaded brass nut to allow for a uniform expansion and contraction caused by heat. The entire tool is easily disassembled and reassembled. When new brushes are to be installed it is necessary to remove only one screw and the brushes are then exposed.



B. & S. Adapter Plate

B. & S. Adapter Plate

The piece of equipment shown in the illustration is a Brown & Sharpe Adapter Plate, available in two sizes, for use on the Brown & Sharpe Magnetic Chuck of the Permanent Magnet Type. The plate is designed to hold small pieces which can not readily be held on the regular surface of a magnetic chuck.

When placed on the magnetic chuck, the magnetic flux from the chuck is conducted through the comparatively narrow steel strips of the adapter plate. Each of these narrow magnetic flux circuits is separated only by a narrow non-magnetic base spacing strip, so that correspondingly small pieces can be held

securely over the entire surface of adapter plate.

The No. 510A, which is intended for use on Permanent Magnet Chuck No. 510, is 7 9/32x3x23/32 in. thick. No. 618A, which is for use on Permanent Magnet Chuck No. 618, is 7 23/32 in. thick. Both plates hold 5/16x1/16 in. in size.

4-Speed Motorization Drive

The Production Equipment Company, Cleveland, Ohio, is offering a new Type 1136, which differs from the conventional type of drive for motorization of machine tools. This drive is a 4-speed quick change gear box which is driven by a standard 1800 r.p.m. motor mounted on top of the box. The pulley on the output shaft

M-B "HEAVY DUTY" AIR GRINDER

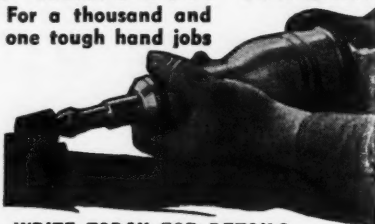
3
Ranges of Speed

25,000, 45,000 and
65,000 R. P. M.

Streamlined, designed
for utmost ease of
handling and control of
air.

M-B PRODUCTS

For a thousand and
one tough hand jobs



WRITE TODAY FOR DETAILS

3
Stages of Power

With maximum torque
of over 1/4 H.P.

Furnished with adapter
for use in tool post
machine for intricate
jobs.

130 E. LARNED
DETROIT, MICH.

"Buy Economy — You'll Effect Economy"

**SOCKET HEAD
CAP SCREWS**

*Milled
from Bar*



**HOLLOW
SET SCREWS**

*Made of
Alloy Steel*

ECONOMY MACHINE PRODUCTS CO.

5216 LAWRENCE AVE.

CHICAGO



Thor STAMPS

for

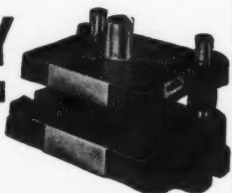
Better Marking

Clear, legible marks for a long time. Special alloy steel, correctly heat-treated — easily read, easily used — central striking point.

If you want economical marking, write for further information and prices.

The Pittsburgh Stamp Co.
2 CANAL ST. PITTSBURGH, PA.

DANLY PRECISION DIE SETS



Danly All-Steel Sets
Danly Commercial Sets
Danly Die Makers' Supplies

DANLY SERVICE

8 Danly Warehouses Provide
24-Hour Service for 85% of
All Metal Fabricating Plants

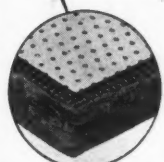
DANLY MACHINE SPECIALTIES, INC.

2122 South 52nd Avenue, Chicago, Ill.
513 East Buffalo Street, Milwaukee, Wis.
Long Island City, N. Y., 38-12 34th Street
Dayton, Ohio, 890 E. Monument Avenue
Detroit, Michigan, 1549 Temple Avenue
Rochester, N. Y., 16 Commercial Street
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Philadelphia, Pa., 3913 North Broad Street

DANLY DIE MAKERS' SUPPLIES

how to **STOP**
PHONE MISTAKES!
INSTALL
THIS QUIET BOOTH
which blots up noise —

• You stop misunderstandings and mis-



takes in verbal orders when you install Burgess 201 phone booths in noisy rooms. In this way you stop the waste in time and money these mistakes always cause. This acoustically designed Burgess booth makes an island of quiet in the midst of machinery roar. Step into the booth and you can hear clearly and can talk without shouting — no matter how loud the din. Easy to install. Burgess 201 booth is steel built and of open construction for sanitary convenience.

TRIAL TEST OFFER

Inside lining of Booth 201 is Burgess Acousti-Pad which absorbs noise and lets you hear clearly and easily.

• Find out how this amazing phone booth controls noise. Learn about the 10 Day Trial Offer which lets you test it. SEND THE COUPON.

Clip this coupon now!

BURGESS BATTERY COMPANY
DEPT. MM. 111 W. MONROE, CHICAGO

SEND: Trial Offer, Descriptive Bulletin, Prices!

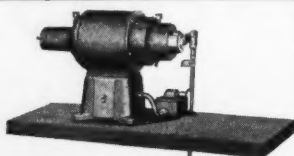
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SPEED LATHES

Timesavers for your Plant

Just the tools for Finishing, Polishing or Lapping of small parts.

The very tools you've been looking for to produce those small parts quickly and economically. Eliminates tying up larger equipment with its slow and make-shift production methods. Built-in features of this new tool allow you to handle rod, tube and chuck stock better than ever before. Send for Circular 351.

Hand, foot or air operated 3-jaw chucks.
Hand or Foot operated collet, sizes from 1/64" to 1/4".
1, 1/2 or 1/4 h.p. AC or DC 2 speed motor.
Steel bed plate or bench optional.

THE SCHAUER MACHINE CO.

2060 READING ROAD, CINCINNATI, OHIO

GRANT RIVETERS

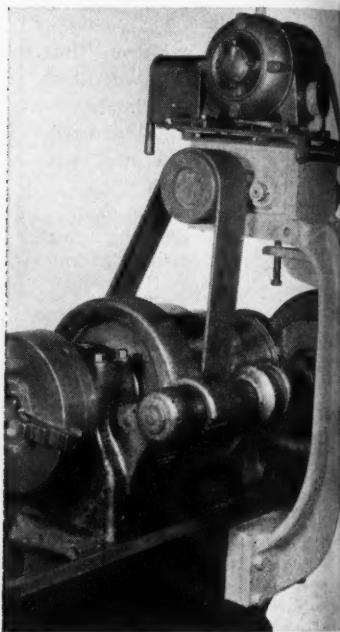


● Pioneers in the riveting field. Head rivets from smallest to 5/8" diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.
Write for literature—and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
96 Silliman Avenue Bridgeport, Conn.

to a single step on the machine pulley or directly to a single V-belt drive is used between motor gear box and a flat belt between box and machine pulley. Gears on hardened steel operating in oil and on splined shafts mounted in bearings.

The drive offers a solution to problems which could not be handled properly by former designs, and offers

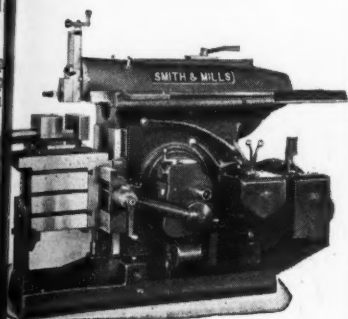


Production 4-Speed Motorization Drive

increases the range of operation of machine. The usual type of drive motorizing cone pulley machines is the countershaft cone pulley for driving to the machine pulley. The speed of the drive cone pulley is obtained using a V-belt or chain drive between the motor and the pulley shaft instead of the use of a gear motor with an extended shaft for mounting the pulley. For some of these drives the cone pulley must be removed from the line shaft and balanced and mounted on the motorization drive. In some cases the pulley must also be machined to secure the factory smoothness in operation.

With the Production Type 1130

SMITH & MILLS SHAPERS



Automatic lubrication—forced feed. Multiple clutch and brake. Quick feed changes. Exact reading feed and stroke dials. Power feed traverse to cross feeds.

THE SMITH & MILLS CO.
CINCINNATI OHIO

Why Use A Shaper to cut Keyways when a

DAVIS KEYSEATER

will do the job so much quicker and better?

Send for circular

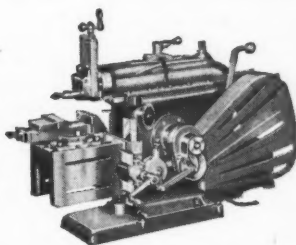


DAVIS KEYSEATER CO.
Exchange & Glasgow Sts.
ROCHESTER, N. Y.

Atlas Precision Tools Made the Modern Way

The modern engineering technique used in the design and manufacture of Atlas Equipment enables you, for the first time, to secure dependable precision machine tools, for high speed production of small parts, at a low investment and low operating cost.

Teamed up with larger machines, or used alone. Atlas Tools help you cut production costs and maintain high production standards. Send for the new 1938 catalog for complete specifications on Atlas lathes, drill presses, shapers, arbor presses, tools and attachments.



NEW 7" SHAPER

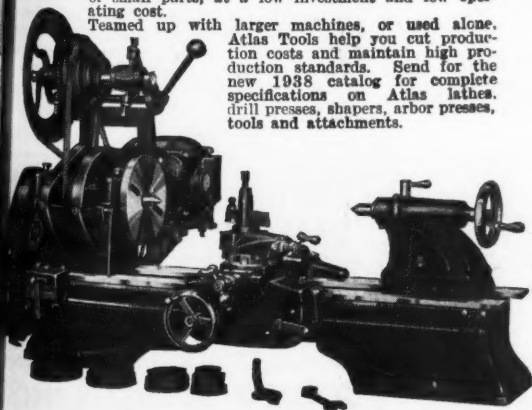
All the precision and power of larger machines built down to scale. 4 speeds, 5 feeds. \$215. with guards.

10" Back Geared LATHE

Complete with countershaft, V-belts, change gears, automatic reversible power feeds, and many other features—\$98.00 complete less motor. Timken bearings \$15.00.

ATLAS PRESS CO.

246 N. Pitcher Street
KALAMAZOO, MICH.



cone pulley is not used. Belt shifting is not required as speed changes are handled by the gear box. This situation is quite an advantage in localities where codes require the use of mechanical means for belt shifting.

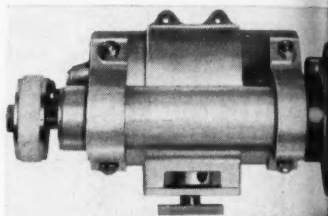
Various types of supports can be supplied for different requirements permitting the mounting of the drive above or at the side of the machine. A very wide range of open belt spindle speeds can be secured with the use of two speed motors, which give 8 different spindle speeds. Also, a special assembly can be furnished using a single speed motor

with the gear box output shaft connected to the countershaft cone pulley. This assembly a 3-step cone would give 12 different spindle speeds.

The Production Equipment Company offers 4 different types of drive for their new bulletin, Form 640, showing the advantages and disadvantages of each type, so that users can select the type they prefer for each application.

Themac Type J-2A and Type J-2B High Speed Lathe Grinders

The two high speed lathe grinders illustrated have been designed for general use in the shop by the McGraw-Hill Manufacturing Company, Jones & Lamson Co., East Rutherford, N. J. The grinders are designed for precision grinding of any size of lathe. It is powered



Themac Type J-2A Lathe Grinder

1/3 h.p. universal motor operating A.C. or D.C. 25-60 cycle current. Idling speed is 16,000 r.p.m. and full load is 12,000 r.p.m. The armature is dynamically balanced and mounted on closed type ball bearings.

The grinding spindle is of hardened steel and is mounted on precision bearings. The distance from center of spindle to center of T-slot bolt is minimum, 2 1/8 in. and, maximum, 3 1/8 in.

New MIDGET PUMP

Large Capacity
... Small Size

This dependable little pump has many uses in any machine shop... for pumping coolant... supplying lubricant... or for general use in transmitting liquids. Vibrationless, quiet, efficient. Top suction assures long life.

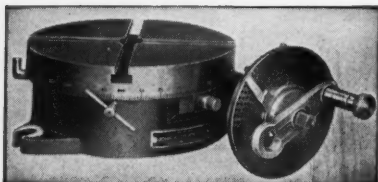


Write for full particulars.

NARRAGANSETT PRODUCTS CORP.

45 Baker Street

Providence, R. I.



7 1/2 in. Rotary Table for Small Miller Tables

Send for circular.

STEVENS ROTARY TABLE INDEXING TYPE

Table graduated for single degree rotation. Worm can be disengaged for turning by hand.

Other sizes 12", 18" and 24" diameters.

JOHN B. STEVENS INC.

306 HUDSON ST.

NEW YORK, N. Y.

THREADWELL TAPS

*for Tough
Tapping Jobs*

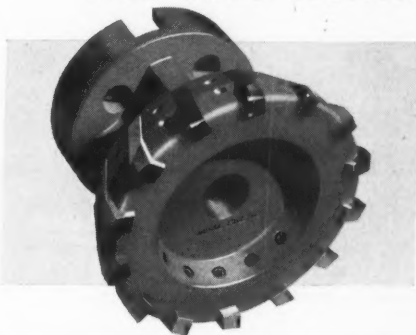
You are assured maximum life and accuracy in your taps when you order from Threadwell. Careful attention is given to heat treatment and inspection.

Regular — Special — Carbon — High Speed — Cut and Ground Threads. Also Threadwell Keyway Cutters, Dies and Screwplates.

Write for Catalog No. 9.

**THREADWELL
TAP & DIE CO.**
GREENFIELD • MASS.

Three Words ARE USED AGAIN



To Describe This NEW STANDARD LINE

Old words take on a new meaning when they are applied to the Morse Tool Company's new standard line of Cemented-Carbide Tipped Milling Cutters. Take, for instance, the time-worn advertising combination—"efficiency . . . economy . . . long life." The exclusive Morse Tool milling cutter construction has always offered the utmost in trouble-free, low-cost service. Serrated blades held securely in position by set screws, permit quick, easy adjustment to compensate for wear. No wedges are used. There is no possibility of loosening of the blades. Replacement—when necessary—is a matter of seconds.

And now, with the application of cemented-carbide tips, these milling cutters take their place with the longest-wearing cutting tools in use today. In design and performance, they remained unsurpassed. Possibly "efficiency . . . economy . . . long life" have been overworked, but your own experience will convince you that no other words are more truly descriptive of this outstanding line of Cemented-Carbide Tipped Milling Cutters.

Your price list on this standard line of Cemented-Carbide Tipped Milling Cutters is ready. Your request will receive our immediate attention.
WRITE TODAY!

Morse Tool Company

116 E. Goldengate Ave.

Detroit.

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SAVE TIME-OIL-WORRY

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MILWAUKEE, WIS., U.S.A.

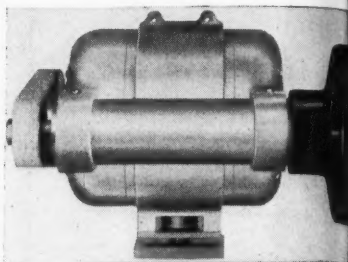
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LITERATURE

in. The maximum distance from the mounting base of the grinder to the center of the spindle is $\frac{5}{8}$ in. A $\frac{1}{8}$ -in. grinding spindle extension is available for external grinding and $2\frac{3}{4}$ in. for internal grinding. Speeds available are 7000, 10,500, 25,000 and 36,000 r.p.m. A $3\frac{1}{2} \times 3\frac{1}{2}$ in. wheel is used. The spindle assembly is detachable from the brackets.

Equipment includes a wheel guard, four pulleys, a belt, cord with feed-through switch and attachment plug, two $\frac{1}{2}$ -in. wheel collars, and 2-in. extension spindle with screw and collar,

can of oil, two wrenches, clamp No. 2 for 9, 10 or 11-in. lathes. Weight complete, 10 $\frac{1}{2}$ pounds.

The Type J-6 Lathe Grinder will grind any size of lathe and is designed to grind periphery of any work that



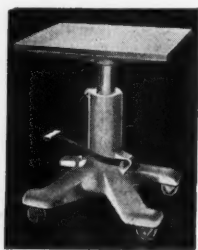
Themac Type J-6 Lathe Grinder

be swung in any size of lathe. This is due to the circumferential adjustment of the grinding spindle.

The Type J-6 is powered by a $\frac{1}{4}$ h.p. motor operating on 110 volt, 60 cycle one phase alternating current. Speed 3450 r.p.m. either idling or full load. The rotor is mounted on closed type precision ball bearings. Forced ventilation prevents overheating. The hardened steel grinding spindle is mounted on precision ball bearings. Distance from center of spindle to center of T-bolt, minimum, $2\frac{1}{4}$ in., maximum 3-13/16 in. A $\frac{1}{8}$ -in. spindle extension is available for external grinding and $2\frac{3}{4}$ in. for internal grinding. Speeds available are 5500, 7600, 15,000 and 19,000 r.p.m. The spindle assembly is detachable from the brackets.

Equipment includes a wheel guard, five pulleys, six belts, three-wire rubber covered cord with switch and attachment plug with ground wire, two $\frac{1}{2}$ in. and two 1-in. wheel collars, a

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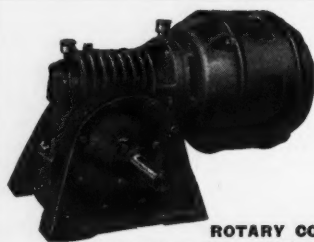


In moving heavy loads weighing up to 2000 lbs. one man can easily raise, lower or move table to required position. Table operated by sturdy hydraulic unit. No ratchets or screws to wear. 24x30 table operating between 31 and 46 $\frac{1}{2}$ height from floor. Special sizes made to order.

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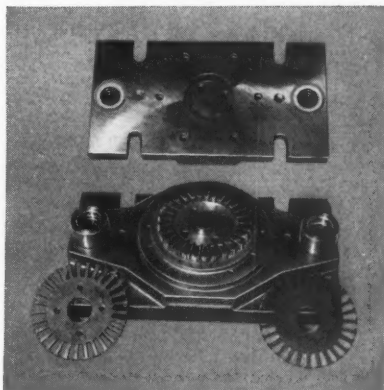
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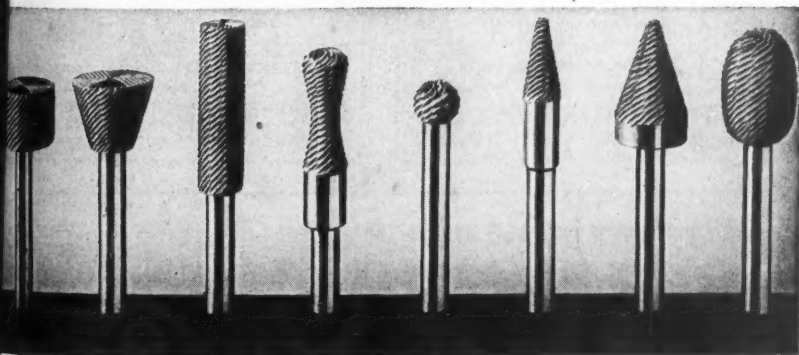
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Just a few of the many standard shapes which are carried in stock.

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wheel spacer washer, ¼-in. chuck body with sleeve, 2-in. extension spindle with collars and nut, can of oil, three wrenches, and clamp nut No. 3 for lathes 11 in. or larger. Weight, complete, 19½ pounds.

Carboloy Tap

Illustrated herewith is a tap of solid Carboloy cemented carbide for use on unfired porcelain. The dimensions of the



Carboloy Tap for Unfired Porcelain

tap are: 1¼ in. long x 0.153 in. dia., 36 pitch, full vee thread. A similar Carboloy tap is now in service that has tapped 70,000 holes at the first regrind, with an estimated life of 280,000 holes.

Experience with these taps has been confined to materials such as Bakelite, unfired porcelain, hard rubber, slate, and so on, but further developments may prove Carboloy taps to be applicable on other materials. The tap illustrated

is a product of Carboloy Company, Inc., 2975 E. Jefferson Ave., Detroit, Mich., manufacturers of Carboloy tools, and grinding wheel dressers.

Supreme Layout Dye

Layout work on metal surfaces can be made comparatively easy by the use of Supreme Layout Dye, according to the manufacturers of the die—Michigan Chrome Co., 6340 East Jefferson Ave., Detroit, Michigan.

The die is applied with a soft cloth or brush and dyes instantly, producing a dark background against which the scribed lines show up in contrast.

It is not necessary to polish after applying.

Supreme Layout Dye can be used on copper, tin, brass, aluminum, stainless steel and other metals in addition to ordinary steel and iron. It is claimed that the scribed lines will not blur or flake away under wet machining operations. The die is supplied in a 5-gallon brush-in-can for shop use, in quart and gallon containers for stock rooms.



TRUMORE Diamond Tools

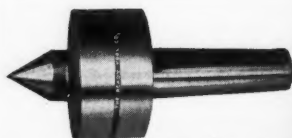
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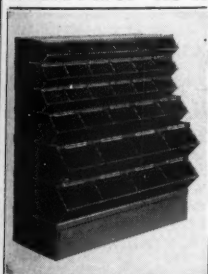
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Fig. 732
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Pat's. Pending

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will stay rigid and its top will always be smooth as a surface plate. The bench can be easily moved to meet changing production set-ups, while two or more may be joined end to end wherever a long smooth working surface is needed—that's more than can be done with wooden benches.

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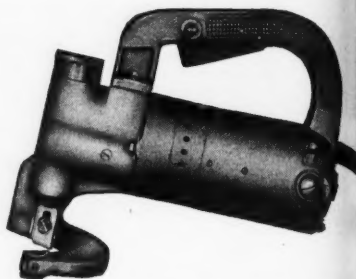
Boston, Chicago, Detroit, St. Louis,
San Francisco, Indianapolis

Klingelhofer Type GES-12 Electric Hand Nibbler Type Shear

The Type GES-12 Electric Hand Nibbler Type Shear illustrated is now being marketed by A. Klingelhofer, Inc., 103 Lafayette St., New York, N. Y. This shear was designed to fill the demand of the sheet metal industry for a powerful electric hand shear which will cut accurately to the line along straight lines as well as on small curves. The tool has a capacity of $\frac{1}{8}$ -in. boiler plate or 14 gauge stainless steel and will cut on a $1\frac{1}{4}$ -in. radius. The tool is strongly

and rigidly built, is simple in construction with no intricate parts, rapid and smooth in operation, and is said to cut accurately to the line.

The tool is powered by a ball bearing

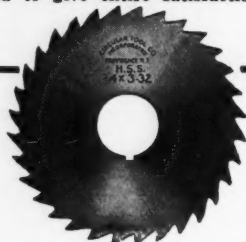


Klingelhofer Type GES-12 Electric Hand Nibbler Type Shear

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type universal motor of 1/6 h.p. and operates on either A.C. or D.C. 110 or 220 volt, 25 to 60 cycle current. Special type reduction gears reduce the speed to approximately 1800 cuts per minute and amplify the power. The cutters are made from special alloy steel to insure long service. They can easily be resharpened and adjusted when necessary. Sheet steel of $\frac{1}{8}$ in. thickness can be cut at a rate of approximately 6 in. per minute and other sizes in proportion. Weight, 1200 lbs. Equipment includes 17 ft. of cable and a plug.

Speedmaster Wide Range Variable Speed Transmission

A new infinitely variable speed transmission, giving exceptionally wide range has been placed on the market by the Speedmaster Division of the Continental Machine Specialties, Inc., 1301 Washing-



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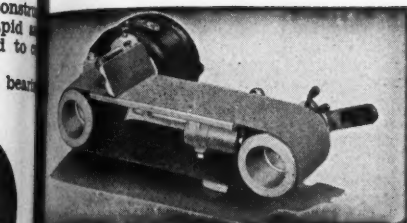
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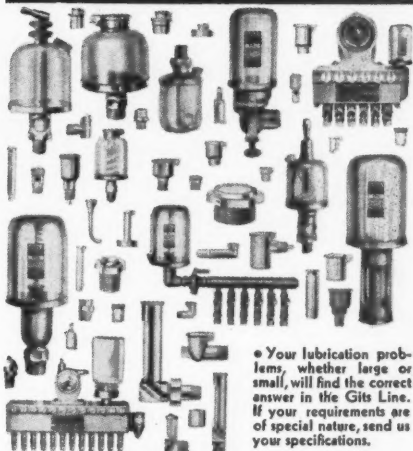
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There are countless spots around your shop where the men must always be on the lookout for nuts that loosen up. These are the places where it would pay you to install "Unshako" Self-Locking Nuts and free your mechanics from this constant vigilance. For, once "Unshako" has been turned up tight, it's there to stay. Vibration can't dislodge it, but with a wrench, it can be taken off without a bit of trouble.



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Pat's. Pending
Fig. 1510

Cutout section showing Locking Ring in place.

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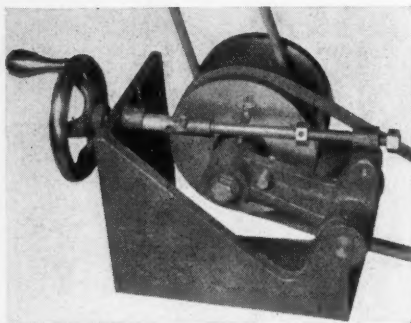
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SAN FRANCISCO

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ton Avenue South, Minneapolis, Minn.

This "Single Unit" gives a six-to-one variation of speed. It is companion to another Speedmaster product recently



Speedmaster Wide Range Variable Speed Transmission

announced, which gives a 40-to-one variation. This new, smaller Unit is completely self-contained, so it may be installed between the motor and the driven machine. It has a hand wheel for changing speeds. A supporting angle frame provides convenient mounting.

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DAMASKIN CHEMICAL CO.

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The special Bakelite pulleys run on hardened and ground spindle and "ite" bearings.

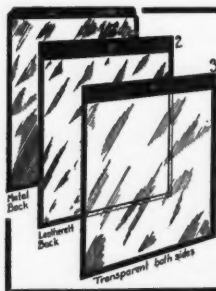
The unit employs standard "V" Bakelite pulley faces assure the extremely long life of these standard. Another distinct advantage of Bakelite pulleys is that static electricity is generated in this drive. To take belts off for replacement is merely a matter of lifting them over the top of the pulley, because the pulley is mounted on a "stub" shaft.

The size of the Bakelite pulleys in the Unit shown in the illustration is 6½-in. outside diameter. The same Unit is available with pulleys having 4½-in. outside diameter and 3½-in. outside diameter. Thus these units may be used for fractional horse power installations or for driving with four or more horse power.

Another advantage is that the unit is mounted rigidly. The "Speedmaster" is merely inserted between the motor and the input shaft making a very simple compact installation.

Narragansett "Midget" Pump

Narragansett Products Corporation,
Baker St., Providence, R. I., has announced a new pump, designed



Wade Shop Envelopes

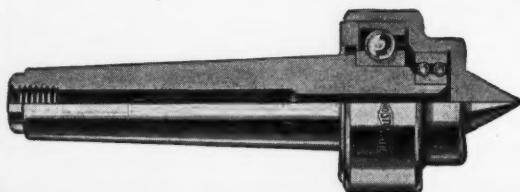
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It turns with the work. Eliminates friction of dead center. Lowest possible overhang prevents vibration and chatter.

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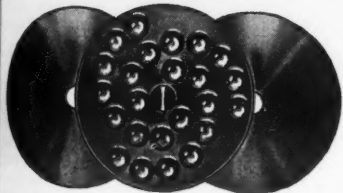
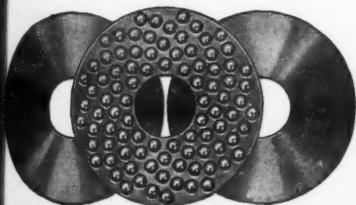
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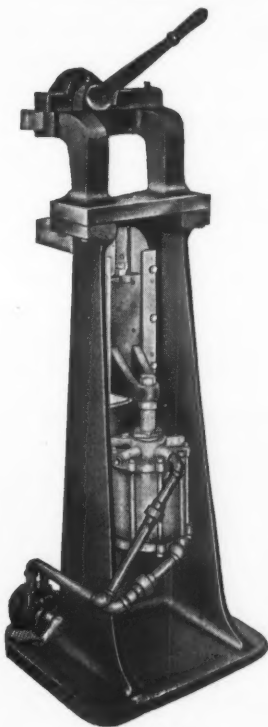
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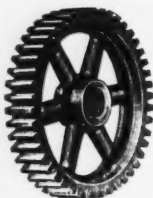
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quiet, vibrationless operation, to known as the "Midget" Pump. This extremely small, this new pump is to be large enough to do many of the jobs now performed in shops by larger pumps . . . and to do them at an appreciable saving.

The pump is easily portable, economical to purchase and operate, and will prove a handy addition to the equipment of any shop. Its versatility adapts it to pumping coolant, circulating liquids and many other uses. The "Midget" Pump is of centrifugal type with top suction to assure long life. Further information is available from the manufacturer.



Narragansett
"Midget" Pump

Landis Special Work Holding Fixture

The odd shape of many threaded parts frequently requires a special holding fixture in order that production standards may be maintained for the threading operation.

Such a fixture, as illustrated in the accompanying photograph, has been designed by Landis Machine Company, Inc., Waynesboro, Pa., for use by one of the large motor car manufacturers. This special fixture was designed for use on the Landmaco Threading Machine and provides an efficient and rapid method of accurately locating the work to assure perfect concentricity between the thread and the work.

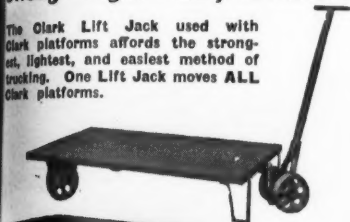
The attachment consists of a special traveling center, not shown in the photograph, a driving block and a locking center. The traveling center is located in the bore of the head to support the front end of the work, and to eliminate any possibility of the chasers landing off center. A long heavy spring, also in the bore of the die head spindle, maintains a constant pressure of the center against the work.

The second center, located on the carriage directly back of a steel block which is cut out to conform to the shape of the work it is to hold, provides the remainder of the supporting

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The Clark Lift Jack used with Clark platforms affords the strongest, lightest, and easiest method of trucking. One Lift Jack moves ALL Clark platforms.



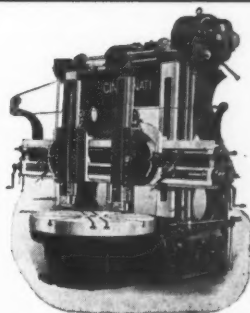
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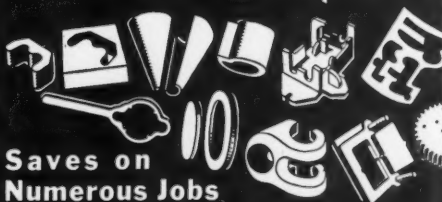
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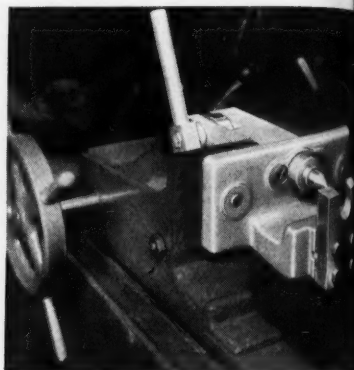
Toward New Horizons

also locking action to the work. This center is supported in a short spindle, the opposite end of which operates against a cam. The cam is mounted on a shaft at right angles to the spindle. One end of the shaft is milled to a hexagon shape and is fitted with short handle. If necessary to do so, the handle may be quickly removed and relocated on the shaft in a convenient operation position.

When used in production, the work is first located on the traveling center, then dropped into the steel block on the carriage. The cam handle is then

pushed forward causing the locking center to engage in the work and it forward until a shoulder on the work rests against the back surface of the driving block.

Since the cam imparts a slow movement to the center spindle, a posi-



Landis Special Work Holding Fixture

locking action is attained the instant the work strikes the driving block. Adjustment is provided in that part of the attachment located on the carriage to permit both horizontal and vertical alignment of the locking center, to the center of rotation of the die head.

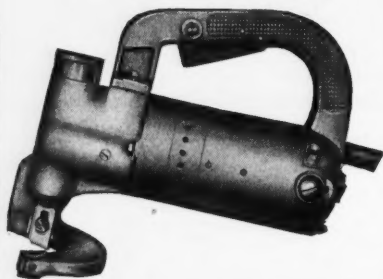
Ohler High Speed Cold Sawing Machine

The Ohler High Speed Cold Sawing Machine built by J. F. Ohler, Remscheid, Germany, is now being marketed in America by A. Klingelhofer, Inc., 103 Lafayette St., New York, N. Y. An outstanding feature of the machine is the

NEW ELECTRIC HAND SHEAR

(NIBBLER TYPE)

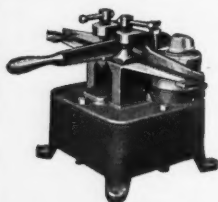
CUTS $\frac{1}{8}$ " BOILER PLATE



Clean and accurate cutting with GES-12 Heavy-Duty Electric Hand Shear (nibbler type). Cuts $\frac{1}{8}$ " boiler plate or 14 gauge stainless steel. Smallest radius $1\frac{1}{4}$ ". Write for illustrated data sheet on this and other models.

A. KLINGELHOFFER, Inc.

103 LAFAYETTE ST. NEW YORK CITY



No. 162
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Braze Narrow Band Saws Electrically

Save Saws, Time and Expense

The superiority of electric brazing is now established beyond question. Perfect brazes assured. Fast, safe, economical, part of the advanced service in filing, setting and brazing narrow band saws perfected by the pioneers in the industry.

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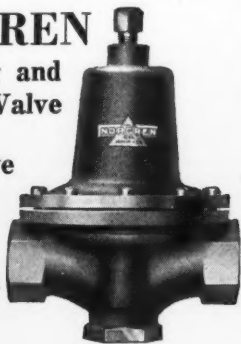
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the Valve
with the
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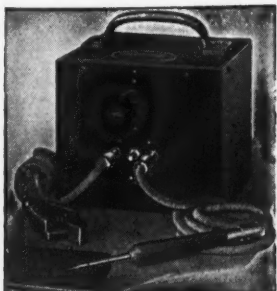
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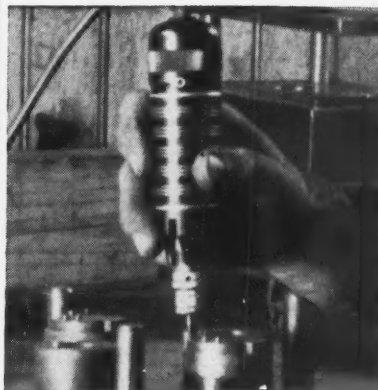
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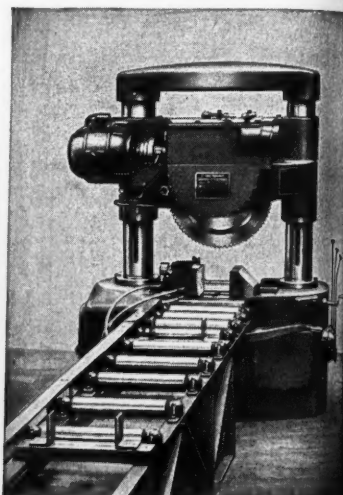
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smooth and chatter-free performance which is due to the powerful and rigid frame. The main frame members are two cylindrical columns mounted on heavy base and closed by a cross beam at the top as shown in the illustration. The carriage, with its guide cylinders, moves hydraulically along the accurate ground columns and thus in itself provides additional reinforcement for the frame.

The saw blade is mounted in



Ohler Model 660 High Speed Cold Saw Machine

exact center of the carriage, between the columns, and the material to be cut is clamped in a hydraulic vise directly under the center of the saw blade, thus reducing the cutting time to the minimum. Coolant is fed into the cut on both sides of the blade, thus keeping the cutting teeth always immersed and greatly increasing the life of the blades and the cutting efficiency. The hydraulic control system is centrally located and operated by means of the control levers which are interlocked with each other, thus preventing all possible operating errors.

The saw carriage is moved to and from the work by two hydraulic cylinders of which are mounted on the base of each column with the pistons connected to the guide cylinders on each side of the carriage. This construction provides for perfectly balanced

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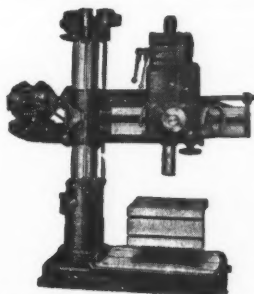
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60 in.	30 in.	2,000
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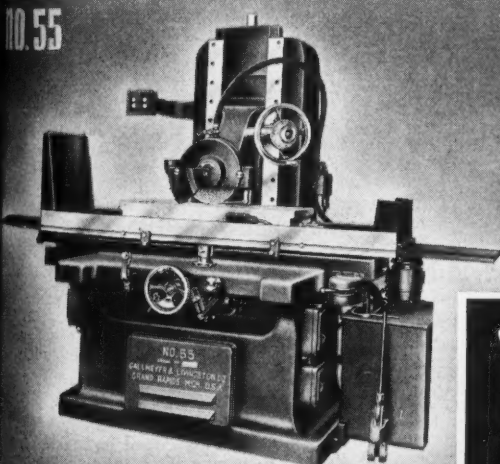
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friction-free sliding of the carriage. The saw carriage has rapid return either automatically after the cut is finished or by hand control. All hydraulic operations are simply controlled by three levers, which are interlocked to prevent the possibility of errors. One lever controls the operation of the roller conveyor, the second operates the hydraulic vise, and the third controls the movement of the saw carriage, which has rapid return to the "up" position either automatically or manually.

The feed of the saw is adjustable in infinite steps from 0 to 20 in. per minute. A dial indicates the amount of feed

and above the dial is located a control for resetting the vise. The motor-driven coolant pump is controlled by another lever with a push button for starting and stopping the main motor pump. Power is supplied from the main motor through a gear box which provides different saw speeds ranging from 20 to 140 ft. per minute. The gears are chrome nickel steel, hardened on the ground, and the shafts are mounted on roller bearings. The saw blade is carried in heavy bearings, one of which is mounted on a heavy hinged frame that can be opened like a door to facilitate changing of saw blades.

Ohler segment type saw blades are employed, the segments being made of high speed steel and tongued and grooved into a milled groove in the body of the saw blade, which is made of alloy steel. The segments are held in the saw means of the rivets and the rivet connects each segment with the other.

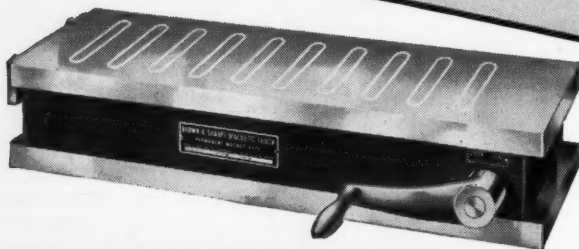
The machine is made in four sizes. The largest, Model 1000, is designed to use 36, 40 and 42 in. saws. With the smallest and largest blades, the capacities are, respectively, 12 and 14 in.; squares, 12 and 14 in., and beams, 16 and 18 in. The machine with electric equipment, weighs 17,500 lbs. and requires floor space 4x6½ ft. A 12 ft. long conveyor is available with the machine.

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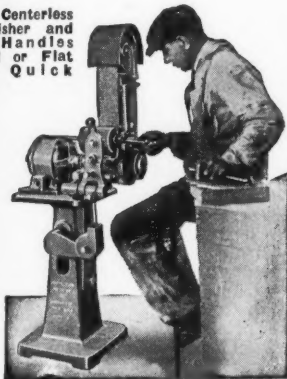
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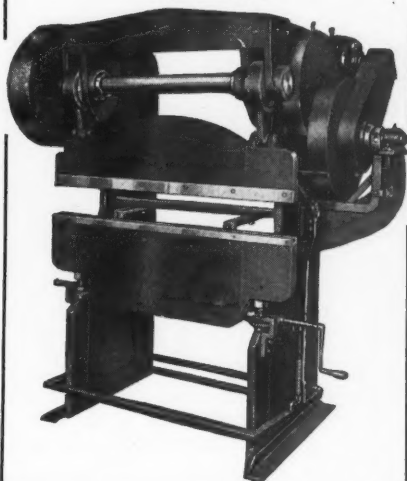
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ment or other parts of the plant by the use of the Midwest Hydraulic Portable Table illustrated here-with. The table, which is a product of The Midwest Tool & Engineering Co., 112 Webster St., Dayton, Ohio, is designed to employ a compact, highly efficient hydraulic mechanism by which the table can be elevated or lowered to any desired height by a simple pressure of the foot, leaving the operator's hands free at all times. In addition to serving as a means for conveying work or tools from the bench to the machine, the table can be used as a portable bench or as a plate for laying out work. The plate which comprises the top is well ribbed and accurately machined, making a good surface plate.

The table is 24x30 in. and the dimension of the base is 26x31 in. Capacity is 2000 lbs. The table can be elevated to a maximum height from the



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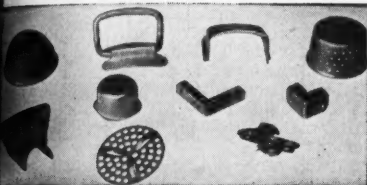


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floor of 46½ in. or lowered to a minimum height of 31 in. Weight, 350 lb.

Dalrae "Midgetmill"

The illustrations show the Dalrae Midgetmill which has been announced by Dalrae Tools Company, Syracuse, N. Y. The Midgetmill is similar in size to the Dalrae Speedmill, but is designed so that it can be used to drill, bore or mill. The illustration Fig. 1 shows the Midgetmill as set up on a Milwaukee Horizontal Milling Machine and equipped with a drill for vertical drilling.

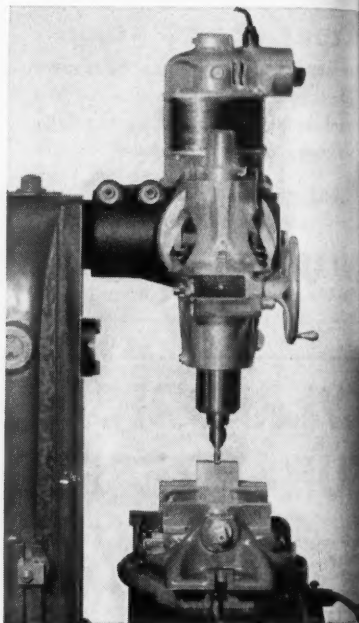


Fig. 1—Dalrae Midgetmill, designed to facilitate drilling, boring or milling.

The quill is operated through a triple lead thread and is hardened and ground all over. A bronze nut which is actuated by a hardened and ground worm serves as the feeding member for the quill. The quill is housed in a hardened and ground heavy proportioned sleeve shrunk into the main aluminum casting. It is claimed that a smooth feeding action operated by a large hand wheel is obtained through the use of the threaded

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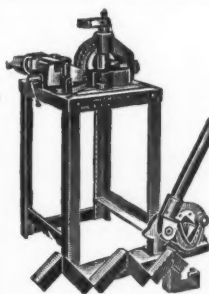


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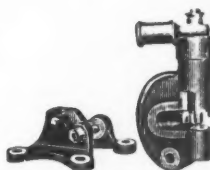
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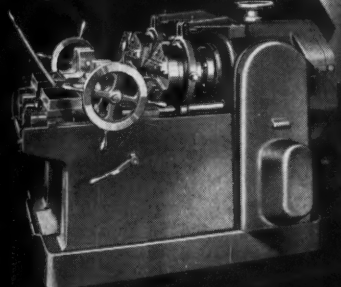


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is provided through the use of a standard counter that is operated from the worm shaft. This unique method eliminates the usual dials or graduations and provides an extremely accurate direct reading device. Tests have shown the maximum error in a $2\frac{1}{2}$ -in. stroke to be 0.00025 inch.

The outstanding features of the Dalrae Speedmill are again applied on the Dalrae Midgetmill, such as the use of aluminum castings wherever permissible, heavy cast iron cradle and balanced design. Efforts have been made to distribute the weight equally on either side of the overarm for safety and convenience.

One of the outstanding features of the Midgetmill is the use of a Veeder counter for setting tools. This counter is employed instead of the usual dials and as it is designed so that each figure

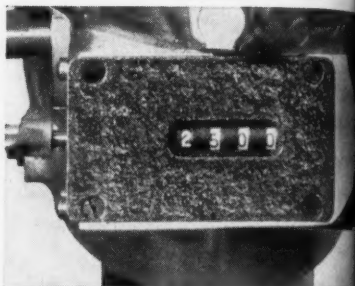


Fig. 2—The Midgetmill is equipped with counter, the figures of which represent thousandths of an inch. The counter simplifies calculations, minimizes the possibility of error, and is much easier to read than graduations on a dial.

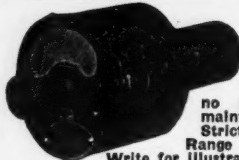
on the counter represents 0.001 in., the operator can very easily work to fractions of a thousandth of an inch without the necessity of trying to split graduations on a dial with the aid of a microscope.



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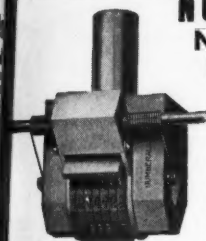
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The Multiduty Die Truck shown in the illustration, product of O. Johnson Company, Brookfield, Ill., was designed to simplify the handling of dies and



Multiduty Die Truck

heavy machined parts and is equipped with a built-in hoist for separating and assembling heavy leader pin die sets. Dies weighing 1000 lbs. and more can easily be separated by one man with this equipment.

The truck is of steel throughout, adequately braced. The beams and plates are electric welded for rigidity and long wear. Ball bearing heavy duty casters assure easy rolling, even when heavily loaded. Two of the casters are of the swivel type and two are stationary. The table is adjustable vertically to permit dies and other heavy parts to be transferred without effort from the table to the bench or machine and vice versa. The spools on the overhead shafts can easily

be adjusted to take care of any die to a maximum of 40 in. The adjustable punch holder clamps may be adjusted with set screws to fit any holder up to 3 inches.

The table is 30x42 in. in size and a minimum of 24 in. can be swung between the table and the overhand shaft. The maximum, 38 in. The truck can be loaded safely to 5000 lbs. and the amount of safe load that can be picked up by the overhead shaft is 1600 lbs. Overall length, 46 in. Overall width, 30 in. Overall height, 66 in. Weight, 360 pounds.

Wardwell Heavy Duty High Speed Band Saw Hammer Setter

The Heavy Duty High Speed Band Saw Hammer Setter shown in the illustration was developed by The Wardwell Manufacturing Co., 3166 Fulton Rd., Cleveland, Ohio, to meet the requirements of plants where a large amount of setting is performed daily, requiring a rapid working, well built machine which will operate at a fast speed while insuring accurate, uniform setting of teeth. The machine is fully automatic in operation.

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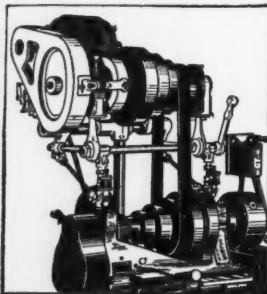
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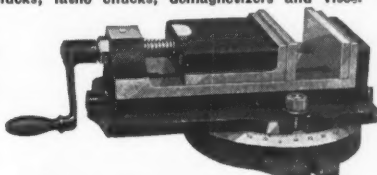
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This large, semi-steel vise which can be used plain or swivel is suitable for milling machine, drill press or shaper. Has sturdy 6 1/2" steel jaws, 2" deep. Jaws open 4 1/2", or 5 1/4" without steel jaws. Four bolts and key slots provide for attaching to machine table, holding surface and jaws at right angles or parallel to table.



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Toledo, Ohio

Shipping weight 90 lbs.	\$29.50
6 1/2" size.....	
Made in two sizes.	\$21.00
4 1/2" size.....	

and the bearings are long and of ample size to conform to the construction of the machine. The hammer arms are connected, one on each side at the lower end of the frame with a double cam between the two lever hammer arms. As the cam rotates, it spreads the two lever hammer arms apart and as the cam rider comes to a drop in the cam, the arms come together simultaneously, one on each side, striking the teeth against the anvil with a sharp, quick blow, giving the teeth exact and uniform set. The hammers can be adjusted for hard or light blows.



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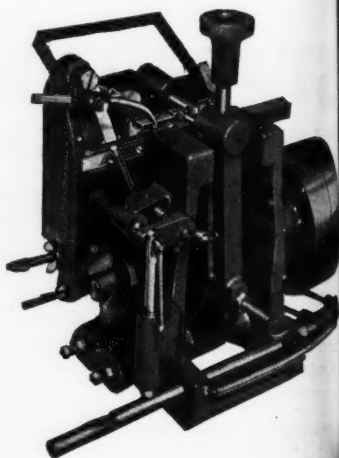
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The hammers can be adjusted likewise of the saw to take care of variations in spacing of teeth. As two hammers are set simultaneously, two teeth are set to the setting position at a time.



Wardwell Heavy Duty High Speed Band Hammer Setter

setting four teeth for each revolution of the cam shaft.

The vise jaws are made of tool steel and are hardened and ground. One jaw is adjustable to suit any gauge of work. The saw is quickly clamped or loosened by means of a lever which opens the jaw.

The feed pawl lever is pivoted on a 1/2-in. shaft having a bearing 4 1/2 in. long. The feed finger is raised up out of the way when inserting a saw into the machine. The saw support extends the full length of the vise jaws and

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have been constantly improved during the past 31 years. That is why they are preferred by machinists and tool makers and other particular mechanics. Choose yours from Free Catalog.

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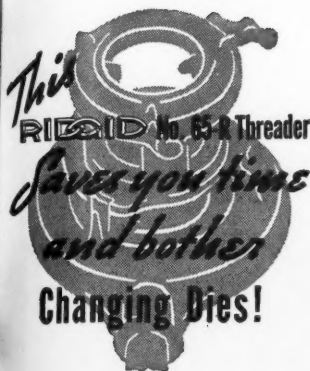
MULTIPLE SPLINE Set Screw

Brute force does not strip or round out Bristo Cap and Set Screws. Of the performance-proved multiple spline socket design, Bristos permit a much T-I-G-H-T-E-R set-up with no danger of loosening in tough service. Write for Bulletin 833 today. The Bristol Company, Mill Supplies Division, Waterbury, Connecticut.

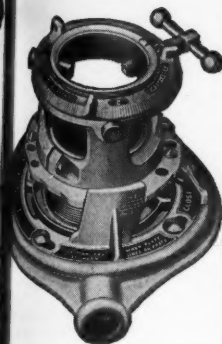
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Multiple Spline

SET AND CAP SCREWS



You've got more important things to do than changing dies to thread 1", 1 1/4", 1 1/2", and 2" pipe. And this **RIGID** No. 65 R saves you the trouble—all pipe, all threads.



For in this remarkable tool, the same set of dies threads all 4 sizes perfectly. Simply move setting post to size you want. No extra dies to lug around, to worry about losing.

Slip work-holder, too—sets quickly to pipe size, tightens with one screw. A strong, beautifully balanced tool pleasing thousands by its fast clean work. Try it—you like the "feel" of it at once. Buy from your Jobber.

The Ridge Tool Co., Elyria, Ohio

RIGID

PIPE TOOLS

adjustable for different widths of saw blades by means of a screw which is operated from the top of the machine. The top guides are adjustable for height.

For belt drive, the machine weighs 90 lbs. and occupies 2.1 cu. ft. of space. For motor drive, the machine weighs 125 lbs. and occupies 4 cu. ft. of space.

"Budgit" Light Weight Portable Electric Hoist

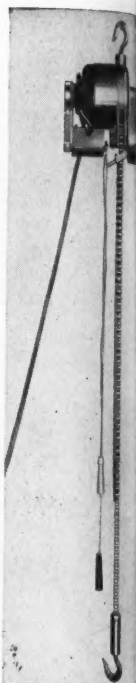
A light weight portable electric hoist of 500 lb. lifting capacity has been placed on the market by Shaw-Box

Crane & Hoist Division, Manning, Maxwell & Moore, Inc., Muskegon, Mich., under the trade name "Budgit".

The hoist is believed to be the first electric hoist that weighs less than a hand-operated spur geared chain hoist of equal capacity. Complete, it weighs 58 lbs. Operating from lighting sockets, no additional wiring or special conductor systems are required to install it.

The hoist is regularly equipped with sufficient lifting chain to give a lift of 19 ft. Additional lift is possible by lengthening the lifting chain. The distance between the upper hook and the load hook when in its highest position is only 16 in. The lifting speed with 500-lb. load is 17 ft. per minute.

Included in its design are several interesting safety features, among which are a convenient "one hand" control safety stops that prevent overtravel of the hoist hook in both the hoisting and lowering directions, a spring cushioned load hook that absorbs impacts, a provision that prevents overloading the



"Budgit" Light Weight Portable Electric Hoist

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for general machine shop and tool room use on dies, jigs, fixtures, and machined parts.

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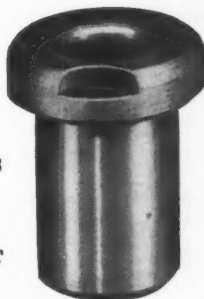
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Universal Drill Bushings

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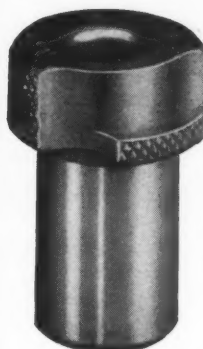
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FRANKENMUTH, MICHIGAN

hoist more than 10 per cent beyond its rated capacity, and an arrangement whereby the load may be lowered either by gravity or power under perfect control.

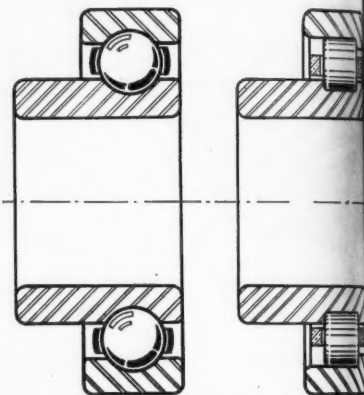
To obtain the performance indicated, advantage has been taken of practices and materials that are new to hoist construction. Roller chain instead of the usual link chain is employed. Gears and pinions are made from alloy steel with machine cut teeth and are heat treated. Load shaft is made from nickel steel. Needle type roller bearings are

used at all bearing points.

Mechanically, this hoist is of simple design. The gear train consists of two gears and pinions. In design the hoist is totally enclosed, with the gear operating in an oil bath.

Norma-Hoffmann Series WIR and Series WIR-L Roller Bearings

Norma-Hoffmann Bearings Corporation, Stamford, Conn., are now supplying

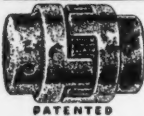


Norma-Hoffmann Series WIR and WIR-L and Roller Bearings

ing two new types of Precision Bearings—the WIR Series of Ball Bearings and the WIR-L Series of Roller Bearings—as shown in the illustrations herewith. The distinctive feature of these new series is the use of a wide inner ring of double-row bearing width, in combination with an outer ring of single-row

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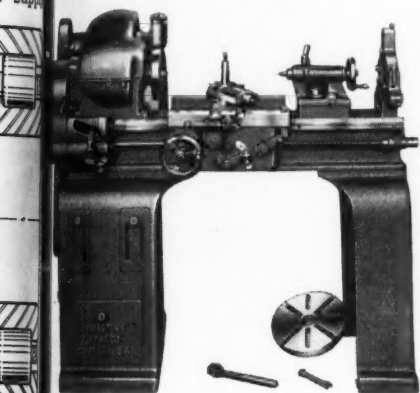
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(Above prices include 3 phase A.C. motor and switch)

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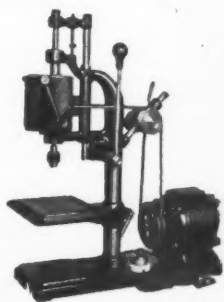
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width. They have been designed primarily for opposed mounting in electric motors and similar equipment. The wide inner ring insures a better sealing on the shaft than the standard single-row ring. In many cases also it avoids the necessity for threading the shaft and applying lock nuts or other locking devices. This elimination of threads permits a larger shaft extension diameter for a given bearing bore and also avoids weakening of the shaft by threading. The WIR Ball Bearings are available in the medium metric series, from 25 to 55 m/m bore. The WIR-L Cylindrical

Roller Bearings with hone-lapped bearing are available in the medium metric series, from 30 to 130 m/m bore.

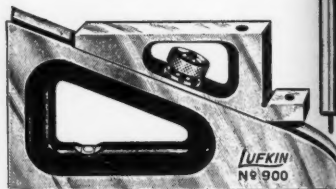
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Lufkin Master Planer and Shaper Gage

naw, Mich. It is known as a "master tool" because it will properly handle many jobs beyond the limits of the average planer gage. This is due to its features and superior construction throughout.

Used as a planer gage, it greatly facilitates adjusting the depth of the cut and setting the tools for other cuts. The proper cut is obtained by setting the gage to a micrometer, a surface gage or caliper, and then bringing the planer tool in contact with it. With the extension, tool settings from $\frac{1}{4}$ to 1 inch can be made; without it, the range is from $\frac{1}{4}$ to $6\frac{1}{2}$ inches.

The gage also serves as an adjustable (sliding) parallel, because the upper

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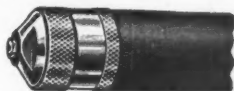
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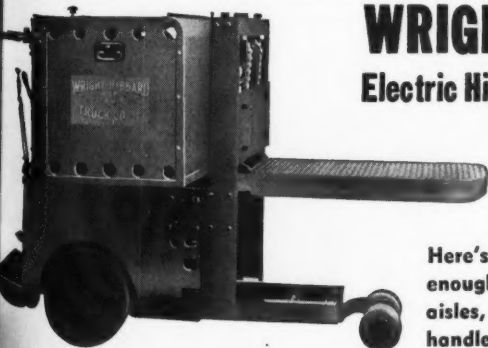
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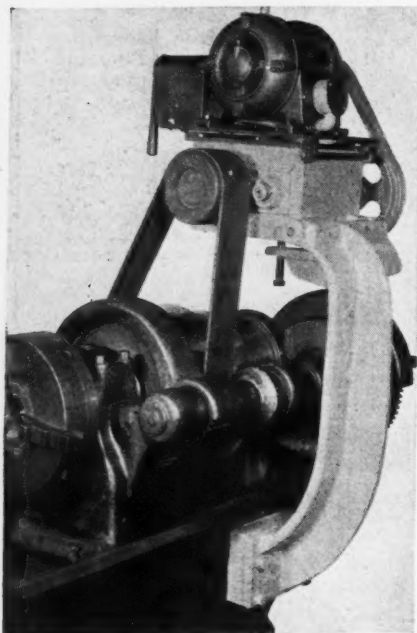


Maximum lift—72". Loading platforms—18" to 28" wide and 34" to 53" long.

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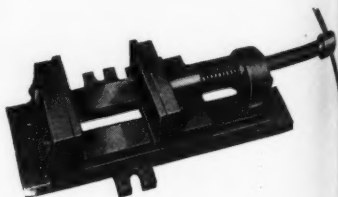
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face of the slide is extra long and slide and base are accurately fitted. can be employed with a sine bar for grinding angles; also with gage blocks for building up work on a surface plate and for transferring measurements to an indicator.

The gage can be used on the base, the end, and also flat on either side. both the slide and the nut are with the outside width of the base and both sides are ground square with the working edges. The base and slide are of forged steel, hardened. The base is $\frac{1}{4}$ in. wide, $5\frac{1}{2}$ in. long, and is fitted with level. A genuine mahogany case can be furnished with this gage.

No. 6 Simplex Drill Press and Milling Machine Vise

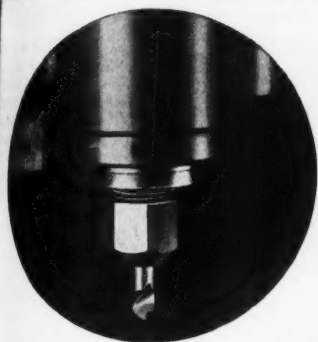
The feature of the No. 6 Simplex Drill Press and Milling Machine Vise illustrated herewith—product of The Desmond-Stephan Mfg. Co., Urbana, Ohio—is the fact that the work which is covered with hardened steel plates which are removable and replaceable. By resting the work on the offset jaws or on parallels, it is possible to drill clean hole without the drill penetrating the vise. The use of these hardened steel plates prevents the vise from becoming drilled full of holes and thus prolongs the strength and usefulness of the vise.



No. 6 Simplex Drill Press and Milling Machine Vise

The screw is fitted through a bronze bushing which can easily be replaced. Four flanges and T-slots in the bottom facilitate fastening the vise in any desired position. The vise jaws, which are hardened and ground, are 6 in. wide and $2\frac{1}{2}$ in. high, and the jaw opening is $6\frac{1}{2}$ in. Weight of the vise, 50 lb. Either offset jaws, as illustrated, or straight faced jaws can be furnished.

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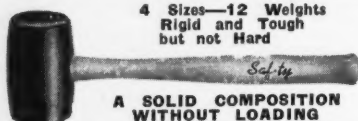
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Precision adjustment SHIMS

"What Makes Main Street." Here is a book which has special appeal for the mechanical executive or engineer because it presents, in pictorial form, the dependence of civilization upon the machine tool. "Main Street" is a street of stores and office buildings and factories and houses which, together with the furnishings, equipment, merchandise, and accessories, represent the products of a wide range of industries—all products of machines which were produced by machine tools.

The fore-part of the book is embellished with a series of pastel paintings

in colors by a noted artist, depicting steps the connection between Main Street and the throng that lives on the Main Street, the homes in which the throng lives on Main Street, the furni-

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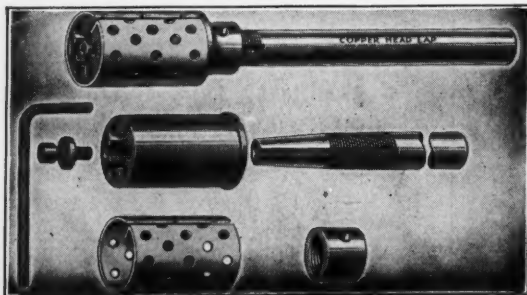


*What makes
Main Street?*

Le Blond · Cincinnati, Ohio, U.S.A.

ings of the home, the factories which make the various kinds of furnishings, the machines and equipment in the various kinds of factories where the furnishings are made, the machine tool which fathers the equipment used to make the furnishings, the engineers involved in the production of the machine tool, and so on. The pictures are modern in their composition and unique in the manner in which they present their story.

The book was published to commemorate the fifty years of service of the



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K. LeBlond Machine Tool Company, Cincinnati, Ohio. While basically factual in its nature, it affords a new and original perspective of the Main Street where LeBlond lathes have played a conspicuous part. The latter part of the book presents an unusual treatment of the subject of lathes, written in concise and understandable language in an endeavor to present a panoramic picture of LeBlond lathes as the prime machine in industrial service.

A copy of the book will be sent to any mechanical engineer or executive who will address a request on his company letterhead.

Holden High Speed Hardening Service. This four-page folder is devoted to an explanation of the methods and advantages of the ceramic method of hardening high speed steel which has been developed by the A. Holden Company, New Haven, Conn. Tools treated by this process are said to be free from scale, and can be made to last, allowing only minor dimensional changes in heat treatment. Copy of the folder free upon request.

Bijur Automatic Lubricating System. According to the manufacturer — the Bijur Lubricating Corp., Long Island, N. Y. — the features of the Bijur System are: no time out for oiling, no lag in lubrication, no bearing ever without oil, no freeze-ups, no drip and no drainage. These advantages and the function of the Bijur Meter-Unit are presented in a four-page folder issued by this firm. Copy free upon request.

Bristol Pyrometers. The line of Bristol Modern Potentiometer Pyrometers, Recorders and Controllers are briefly described in a bulletin which has been published by The Bristol Company, Waterbury, Conn. The special features of the Pyromaster, a recently developed potentiometer with a simplified operating mechanism, are outlined, together with the uses of this instrument as a pyrometer, a resistance thermometer, a tachometer, and a millivoltmeter. Bristol Wide Strip Single and Multiple Recorders and Recording Controllers are also described. Copy of Bulletin No. 493 free upon request.

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"Sullivan Plus Portable Compressors" is the title of a 24-page catalog now being distributed by Sullivan Machinery Company. The booklet, which is profusely illustrated, describes the complete line of two-stage portable air compressors manufactured by this firm and contains specifications and data of value to those concerned with the application of air compressors and air tools to construction and maintenance work. Copies may be had on application to the company's representatives, or to the Sullivan

Machinery Company, Michigan City, Ind.

Folder No. 508, showing the uses of types of Stackers, Tiering Machines and Portable Elevators for piling goods and products from floor to ceiling, to provide additional manufacturing and storage space at no extra expense without the necessity of erecting or leasing additional buildings has just been issued by the Lewis-Shepard Company, 12 Walnut Street, Watertown, Massachusetts. Copy free upon request.